Improved Loading of Baskets of Peaches and Fresh Prunes in Railroad Cars

A Study of Damage and Cost Reduction

Agricultural Marketing Service
Marketing Research Division
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HIGHLIGHTS

For many years, there has been extensive damage in rail shipments of tub-type baskets of peaches, fresh prunes, and similar commodities. The damage is associated with use of the conventional loading methods, called the upright end-to-end offset and crosswise offset methods. It is estimated that the total cost of this damage, including damage claims and the cost of repairing, or recoopering, many thousands of baskets, exceeds $400,000 annually.

Research over a 3-year period has shown that basket damage in rail shipments can be reduced more than 50 percent and important economies achieved in transportation and refrigeration costs by using the alternately inverted crosswise offset method of loading, instead of the conventional upright methods. The research involved nearly 500 test shipments of peaches from Georgia, South Carolina, and Colorado, and fresh prunes from Idaho.

The shipping tests revealed that the alternately inverted crosswise offset loads of 1/2-bushel baskets of peaches averaged 28.3 fewer damaged baskets per car requiring recoopering (including "bad-order" baskets damaged beyond repair) and 10.3 fewer bad-order baskets. These were reductions of 71.1 percent in damaged baskets and 58.5 percent in bad-order baskets. The reductions in damage for the alternately inverted crosswise offset loads of 3/4-bushel baskets of peaches were 9.4 baskets (or 26.3 percent) in the number of baskets per car requiring recoopering, including bad-order baskets, and 3.4 baskets (or 20.1 percent) in the number of bad-order baskets per car. In the alternately inverted crosswise offset loads of 1-bushel baskets of peaches, there were average reductions of 46.2 baskets (or 71.5 percent) per car requiring recoopering, including bad-order baskets, and of 34.9 bad-order baskets per car (or 72.4 percent). For all sizes of baskets of peaches combined, the reductions in basket damage resulting from use of the alternately inverted crosswise offset loading method amounted to 29 baskets per car requiring recoopering, including bad-order baskets, and 14.6 bad-order baskets per car, or 64.9 and 58.6 percent, respectively. Use of the alternately inverted crosswise offset load for shipments of 1/2-bushel baskets of fresh prunes reduced damage by an average of 24.9 baskets per car, or 62.1 percent, in the number of baskets requiring recoopering, including bad-order baskets; and by 14.8 baskets, or 58.3 percent, in the number of bad-order baskets per car.

Federal inspection reports revealed little or no differences in fruit bruising between the upright and inverted baskets in the alternately inverted crosswise offset loads, or between the baskets in the upright check loads and the alternately inverted crosswise offset test loads. Because half of the baskets in an alternately inverted car are in the same upright position as are baskets in a conventional upright load, a direct comparison of bruising can be made between the upright and inverted baskets of fruit of comparable maturity in the same car, packed and loaded at the same packinghouse. This comparison was made on the basis of moderate and severe bruising, sufficient to affect the grade, and slight bruising, not affecting the grade. Most of the serious bruising in both the upright and inverted baskets of the alternately inverted loads was in soft ripe fruit. Slight bruising in the inverted

baskets of prunes in the alternately inverted loads was somewhat greater than in the upright baskets, most of it being on the faces of the packs of this fruit.

Not all of the fruit bruising present at destination was attributable to transportation. In some instances, an important part of the bruising occurred before shipment, resulting from handling and packing of the fruit, from the pressure of hard peaches against ripe peaches when both were packed in the same container, and from unnecessary roughness in dropping or throwing baskets or forcing them into place during the loading of cars.

Shipping tests with recording thermometers in upright end-to-end offset and alternately inverted crosswise offset loads in refrigerator cars with non-precooled peaches and fresh prunes under standard refrigeration indicated that the fruit cooling rates during transit were approximately the same for both types of loads. For the same refrigeration charge per car, therefore, the shipper can move more fruit in the alternately inverted load, which carries more baskets per car than the upright load.

These savings in refrigeration costs are substantial. For example, on an alternately inverted load of peaches in 3/4-bushel baskets from Gramling, S. C., to Chicago, Ill., the savings averaged 2.15 cents per basket, or a total of $14.44. Since the alternately inverted load requires fewer cars to move the same quantity of fruit than does the upright load, the railroads benefit from reduced empty car mileage and other economies, resulting in lower out-of-pocket transportation costs per net ton of fruit moved.

Impact registers placed in test cars of peaches disclosed that, although the alternately inverted loads received more impacts of greater intensity per car than the comparable upright loads, they averaged only about one-third as much basket damage in transit. Approximately 70 percent of all lengthwise impacts received by test shipments of both types of loads occurred in railroad yards and terminals. Because the alternately inverted loads are compact and resistant to lengthwise impacts, basket damage to these loads increased at a slower rate, in relation to load shifts of up to 45 inches, than the rate of basket damage in the standard upright loads.

IMPROVED LOADING OF BASKETS OF PEACHES AND FRESH PRUNES IN RAILROAD CARS

A Study of Damage and Cost Reduction

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BACKGROUND OF STUDY

This study of the alternately inverted loading of baskets in railway cars covers the results of 3 years of extensive shipping experiments with peaches and fresh prunes in tub-type veneer baskets. Its objective was the development and evaluation of a loading method that would substantially reduce the extensive shipping damage that has been associated for many years with the standard upright end-to-end offset and crosswise offset loading methods. The study is one phase of a national program of marketing research aimed at reducing costs and improving efficiency in the marketing of farm products.

For many years, about 95 percent of all peaches shipped by rail from the Southeast in 1/2-bushel and 1-bushel baskets have been loaded by the end-to-end offset or diagonal interlocking loading pattern. Container damage in this type of load has always been high. In the 1954 season, for example, 852 cars of bushel baskets and 817 cars of 1/2-bushel baskets, loaded by the end-to-end offset pattern were inspected by the Railroad Perishable Inspection Agency, and 7.4 percent of the bushel baskets and 3.1 percent of the 1/2-bushels were found to be seriously damaged upon arrival at the markets. This involved 46,104 damaged baskets of peaches, of which 25,964 baskets were damaged seriously enough to require disposal at a substantial loss.

These damage figures indicate that, of the total rail shipments of peaches in baskets originated in Georgia and South Carolina alone during the 1954 season, more than 100,000 baskets were damaged upon arrival at terminal markets. The aggregate damage, including loss and damage claim payments and cost of repairing and repacking these thousands of baskets, approximated $300,000 for the season. Such a large loss of marketable fruit and of transportation and productive effort is of significance to growers handlers, and consumers of peaches, as the cost of the damage is reflected, through freight charges of the railroads, in the price the grower receives for the fruit, and in the price paid by the consumer.

The increasing cost of this recurring damage led to the inauguration in 1954 of research aimed at developing an improved method of loading the baskets in cars, to reduce the damage and to move peaches and fresh prunes to markets in better condition. Several exploratory shipments of bushel baskets of peaches loaded by the alternately inverted crosswise offset method were made from South Carolina to New York City during the 1953 season. Results of these first limited shipments were so promising that a cooperative program of shipping experiments with the alternately inverted load was set up for the 1954 season

in Georgia and South Carolina. The study was followed through in these States and other producing areas in 1955 and 1956. The Association of American Railroads, the American Veneer Package Association, and the railroad inspection agencies actively cooperated with the U. S. Department of Agriculture in carrying out the program.

AMOUNT AND TYPE OF TRANSPORTATION LOSSES

Concern over the increasing cost of loss and damage of fruits and vegetables shipped in 1/2-, 3/4-, and 1-bushel baskets over several years was the primary factor which led to the experiments with the alternately inverted crosswise offset loading method. Because the baskets are flexible, the principal damage is basket breakage resulting from shifting of loads in transit. Losses from bruising and decay are assumed by the grower, shipper, or carlot receiver who holds title to a shipment. But most of the visible physical damage at the time of unloading, such as breakage, is borne by the transportation agency through loss and damage claim payments to owners of shipments.

Total and per-car claim payments made by the Class I railroads for loss and damage to peaches from 1946 to 1955, the latest year for which such data are available, are presented in table 1. The total payments shown here have

Table 1.--Loss and damage claim payments for peaches by all Class I railroads, 1946-1955 1/

Year	Cars originated	Total loss and damage claim payments	Average loss and damage claim payments per car
	Number	Dollars	Dollars
1955	8,068	343,695	42.60
1954	11,352	481,627	42.43
1953	12,737	689,203	54.11
1952	13,654	636,731	46.63
1951	15,756	470,432	29.86
1950	8,752	304,128	34.75
1949	12,768	810,891	63.51
1948	16,711	1,067,611	63.89
1947	26,344	983,533	37.33
1946	31,702	957,762	30.21

1/ Circulars No. FCD-1300 (1946), FCD-1340 (1947), FCD-1390 (1948), FCD-1431 (1949), FCD-1468 Revised (1950), FCD-1503 (1951), FCD-1554 (1952), FCD-1589 (1953), FCD-1620 (1954), and FCD-1655 (1955) of Freight Claim Division, Association of American Railroads. The circulars do not segregate claim payments by cause of damage.

averaged $675,000 a year for the 10-year period. The average payments per car declined from 1946 to 1951 to a low of $29.86, but they rose to $54.11 in 1953 and were still at the levels of $42.43 and $42.60 in 1954 and 1955, respectively. The last 2 figures were the third highest among the railroads' average per-car payments on all carloads of fresh fruits, melons, and vegetables in those 2 years. The average per-car loss and damage claim payments of $42.60 for peaches in 1955 may be contrasted with the average per-car payment in the same year of $14.49 on all cars of fresh fruit, melons, and vegetables, $32.30 on tomatoes, $13.65 on oranges, $13.29 on grapes, and $12.35 on apples.

The data of the Association of American Railroads on total and per-car loss and damage claim payments by all Class I railroads combine the figures for fresh prunes and plums. Although there is no separation for fresh prunes, reference to the combined figures, as shown in table 2 for the 10-year period 1946-1955, will help to give some indication of the trend of loss and damage claim payments for that commodity. The claim payments for fresh prunes and plums during the 10-year period averaged $264,000 per year. The average claim payments per car on these 2 commodities, as shown in table 2, rose from a low of $22.60 in 1951 to $41.96 in 1952 and were $40.41 in 1954, dropping to $23.73 in 1955. The average per car of $23.73 in 1955 was still $9.24 in excess of the $14.49 average per car for all carloads of fresh fruits, melons, and vegetables.

Table 2.--Loss and damage claim payments for fresh prunes and plums by all Class I railroads, 1946-1955 1/

Year	Cars originated	Total loss and damage claim payments	Average loss and damage claim payments per car
	Number	Dollars	Dollars
1955	6,997	166,007	23.73
1954	4,715	190,520	40.41
1953	6,973	234,201	33.59
1952	5,415	227,203	41.96
1951	6,938	156,789	22.60
1950	5,157	189,947	36.83
1949	6,874	250,185	36.40
1948	7,164	388,368	54.21
1947	8,466	381,364	45.05
1946	8,750	455,510	52.06

1/ Circulars Nos. FCD-1300 (1946), FCD-1340 (1947), FCD-1390 (1948), FCD-1431 (1949), FCD-1468 Revised (1950), FCD-1503 (1951), FCD-1554 (1952), FCD-1589 (1953), FCD-1620 (1954, and FCD-1655 (1955) of Freight Claim Division, Association of American Railroads. The circulars do not segregate claim payments by cause of damage.

Table 3.--Loss and damage claim payments for peaches by Class I railroads reporting payments by type or cause of damage, 1948-52 1/

Year	Unlocated loss and damage		Delay in transit		All other causes 2/		Total	
	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent
1952........	458,532	77	80,293	13	58,212	10	597,037	100
1951........	313,688	72	79,705	18	40,741	10	434,134	100
1950........	144,517	51	61,571	22	74,640	27	280,728	100
1949........	434,427	55	242,373	30	122,613	15	799,413	100
1948........	642,815	62	260,165	25	135,663	13	1,038,643	100
Total or average....	1,993,979	63	724,107	23	431,869	14	3,149,955	100

1/ Fifty-six railroads reporting in 1948, 58 in 1949, and 52 in 1950-52, representing more than 90 percent of the carload proportion of total claims paid on fruit, melons, and vegetables. Circulars Nos. FCD-1385 (1948), FCD-1427 (1949), FCD-1466 (1950), FCD-1504 (1951), and FCD-1555 (1952) of Freight Claim Division, Association of American Railroads. These circulars segregate claim payments on carload traffic by type or cause of damage.

2/ Includes train accidents, thefts, temperature failures, defective equipment, improper handling, errors of employees, fires, and other causes.

A tabulation of Class I railroads' reported claim payments for peaches by type or cause of damage from 1948 to 1952 appears in table 3. No similar data have been published by the Association of American Railroads since 1952. This analysis shows that, during the period covered by the data, from 62 to 77 percent of the total claim payments were for "unlocated loss and damage," principally involving visible physical damage in the form of basket breakage, spillage, and the resultant bruising and cutting of the fruit. Claim payments for in-transit delay absorbed from 13 to 30 percent of the total, while from 10 to 27 percent of the total was paid for all other causes, including fire, theft, temperature failures, defective equipment, improper handling, and train accidents.

Loss and damage claim payments by Class I railroads for fresh prunes for the years 1948 through 1952 by type or cause of damage are shown in table 4, which is based on data of the Association of American Railroads showing separate figures for this commodity. No such data are available after 1952. During this period, the claim payments for unlocated loss and damage, which was mainly visible physical damage consisting of breakage, spillage, and the associated bruising and cutting of the fruit, absorbed from 58 to 81 percent of the total payments. The other proportions of the total payments ranged from 18 to 38 percent for delay-in-transit claims and from less than 1 percent to 4 percent for all other causes. The latter category included fire, theft, train accidents, temperature failures, defective equipment, and improper handling.

Seasonal studies by the Railroad Perishable Inspection Agency show that there were received at 38 markets in that Agency's territory, for the 4 seasons of 1951, 1953, 1954, and 1956 combined, 4,246 cars of 1/2-bushel baskets, 1,125 cars of 3/4-bushel baskets, and 8,007 cars of 1-bushel baskets of peaches, which were loaded upright in standard end-to-end offset and standard crosswise offset loads. There was no Agency study of unloadings of peaches in baskets in 1952 and no comprehensive analysis for the 1955 season was undertaken because of a serious crop failure of southeastern and eastern peaches, resulting from late spring freezes in that year.

Figure 1, which is based on table 23 in the appendix, shows the average number of 1/2-bushel, 3/4-bushel, and 1-bushel baskets of peaches damaged per car in the cars of upright loads referred to in the preceding paragraph.

This figure presents graphically for each size of basket the average number of damaged baskets per car requiring recoopering (including those beyond repair) and the average number per car delivered "in bad order" (damaged beyond repair). Throughout this report, baskets described as requiring recoopering include those beyond repair. It will be noted that generally more than half of the baskets requiring recoopering were beyond repair (fig. 2).

A further examination of figure 1 reveals that the average number of 1/2-bushel and 3/4-bushel baskets per car requiring recoopering and the average number per car delivered in bad order during the 1956 season exceeded similar averages for the preceding seasons. The averages per car of 1-bushel

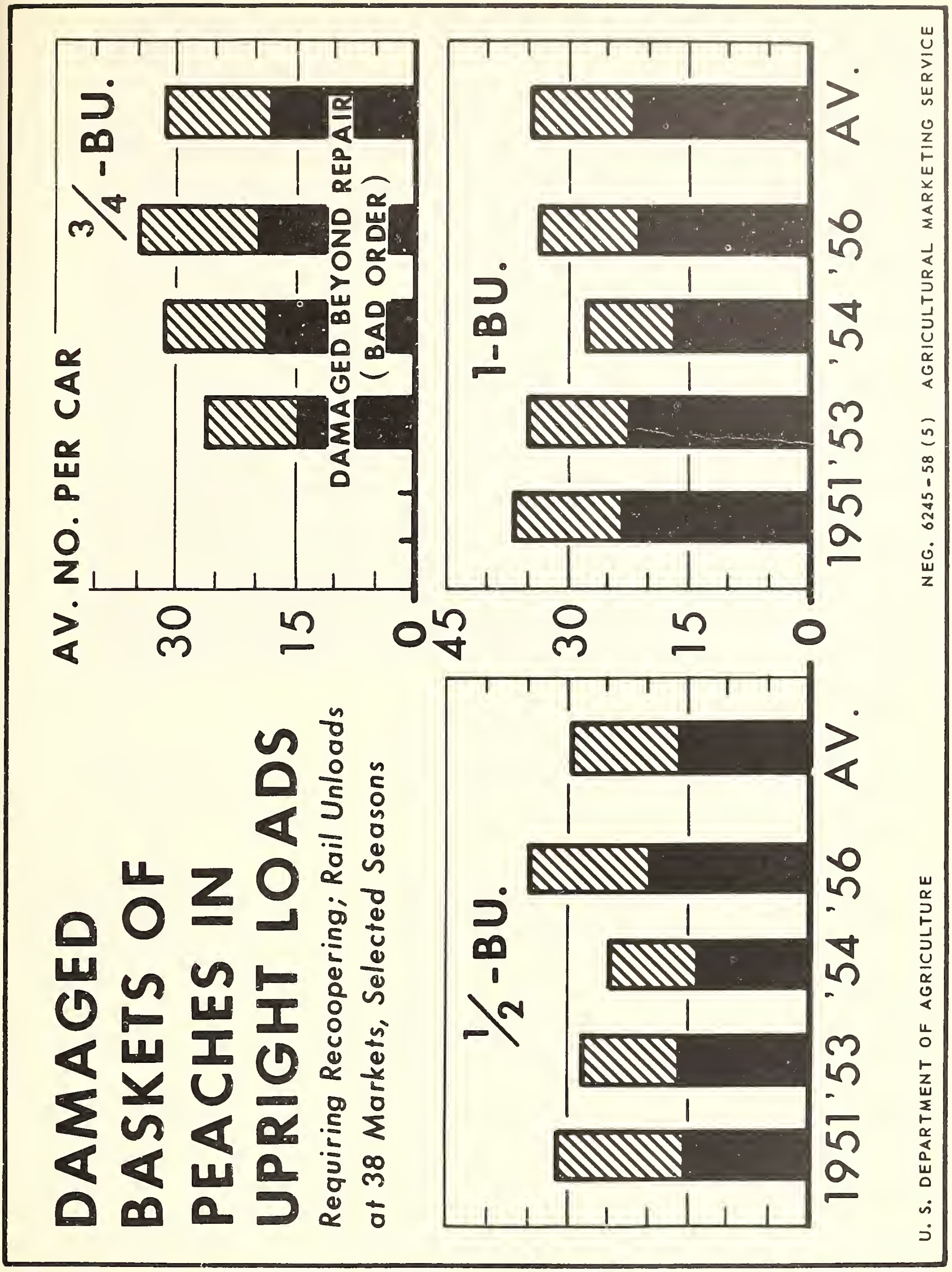
Table 4.--Loss and damage claim payments for fresh prunes by Class I railroads reporting payments by type or cause of damage, 1948-52 1/

Year	Unlocated loss and damage		Delay in transit		All other causes 2/		Total	
	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent
1952	77,821	81	17,879	18	844	3/	96,544	100
1951	33,304	74	10,526	23	1,239	3	45,069	100
1950	45,339	70	18,233	28	1,562	2	65,134	100
1949	72,438	62	39,686	34	4,802	4	116,926	100
1948	99,844	58	65,726	38	6,573	4	172,143	100
Total or average	328,746	66	152,050	31	15,020	3	495,816	100

1/ Fifty-six railroads reporting in 1948, 58 in 1949, and 52 in 1950-52, representing more than 90 percent of the carload proportion of total claims paid on fruits, melons, and vegetables. Circulars Nos. FCD-1385 (1948), FCD-1427 (1949), FCD-1466 (1950), FCD-1504 (1951), and FCD-1555 (1952) of Freight Claim Division, Association of American Railroads. These circulars segregate payments on carload traffic by type or cause of damage.

2/ Includes train accidents, thefts, temperature failures, defective equipment, improper handling, errors of employees, fires, and other causes.

3/ Less than 1 percent.



DAMAGED BASKETS OF PEACHES IN UPRIGHT LOADS
Requiring Recoopering; Rail Unloads at 38 Markets, Selected Seasons
AV. NO. PER CAR
3/4-BU.
DAMAGED BEYOND REPAIR (BAD ORDER)
1-BU.
1/2-BU.
0
15
30
45
1951 '53 '54 '56 AV.
U. S. DEPARTMENT OF AGRICULTURE
NEG. 6245-58 (5) AGRICULTURAL MARKETING SERVICE

Figure 1

BN-6030

Figure 2.--Cross section of a partly unloaded end-to-end offset load of 1/2-bushel baskets of peaches showing the squeezing and racking of the baskets that sometimes occurs in this type of load.

baskets requiring recoopering and of those delivered in bad order in the 1956 season were less than the corresponding averages per car for the 1951 and 1953 seasons. However, they were 5.8 and 4.5 baskets per car higher, respectively, than the averages of recoopering and bad-order delivery in the 1954 season. For the 4 seasons combined, the average number of baskets per car requiring recoopering and the average delivered in bad order were respectively: 29.7 and 15.8 for the 1/2-bushels, 31.2 and 18 for the 3/4-bushels, and 34.5 and 21.7 for the 1-bushels.

Basket damage to fresh prunes and plums in veneer baskets loaded upright in rail cars is shown in figure 3, developed from table 24 in the appendix. This figure shows graphically the average number of baskets damaged per car in upright loads of both the standard end-to-end offset and standard crosswise offset loading patterns in cars of 1/2-bushel baskets of fresh prunes and plums unloaded in 38 markets in Railroad Perishable Inspection Agency territory during the 1951, 1952, 1953, 1955, and 1956 seasons.

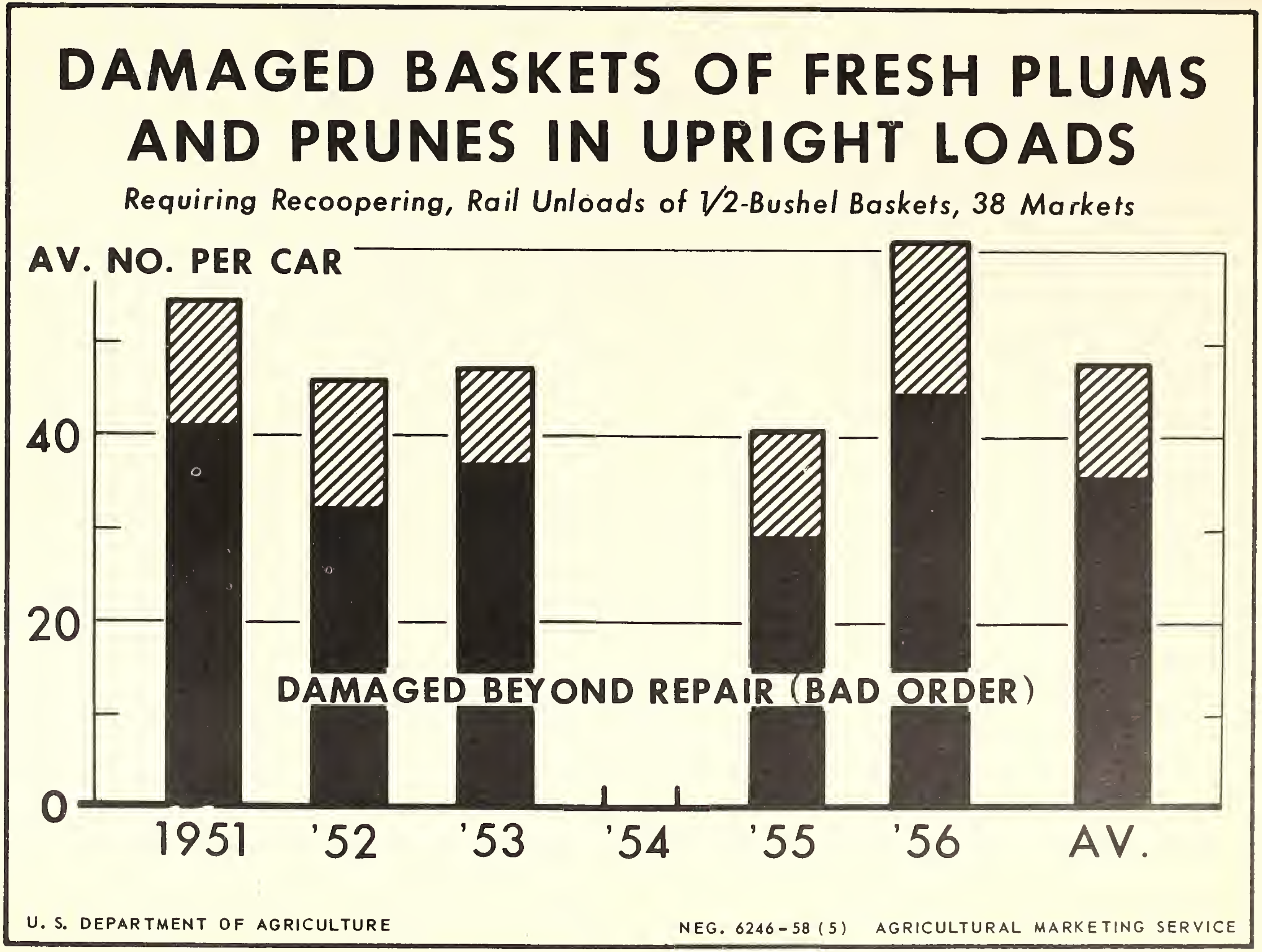

DAMAGED BASKETS OF FRESH PLUMS AND PRUNES IN UPRIGHT LOADS
Requiring Recoopering, Rail Unloads of 1/2-Bushel Baskets, 38 Markets
AV. NO. PER CAR
40
20
0
DAMAGED BEYOND REPAIR (BAD ORDER)
1951
'52
'53
'54
'55
'56
AV.
U. S. DEPARTMENT OF AGRICULTURE
NEG. 6246-58 (5) AGRICULTURAL MARKETING SERVICE

Figure 3

No analysis of unloads was made for the 1954 season. The Agency's basic statistics do not show fresh prunes separately from plums, so the 2 commodities are referred to collectively in figure 3, and in table 24 in the appendix.

Figure 3 indicates that the average number of baskets per car requiring recoopering fell from 54.7 in 1951 to 40.5 in 1955 and rose to 60.8 in 1956. Turning to the baskets "requiring recoopering" which had to be delivered in bad order because of damage too serious for reconditioning, the average per car was 40.9 baskets in 1951, fell to 32.4 in 1952, and then increased to 36.8 in 1953, fell to 29.2 in 1955, and rose to 44.5 in 1956. For the 4,799 cars of upright loads unloaded in the Railroad Perishable Inspection Agency territory during the 5 seasons, the averages per car were 47.8 baskets requiring recoopering and 35.3 baskets delivered in bad order, involving totals of 229,330 and 169,209 baskets, respectively. Figure 3 also shows for each of the 5 seasons, and for the 5 seasons as a whole, that approximately three-fourths of the baskets requiring recoopering were delivered in bad order.

TEST SHIPMENT PROCEDURE

In the alternately inverted crosswise offset loading method, the alternate baskets of each layer and stack are loaded upside down and the alternate layers of each stack are offset crosswise of the car. The method proved to be an effective way to reduce damage in rail shipments of peaches and fresh prunes that had been occurring in the usual upright end-to-end and crosswise offset loading patterns. The principle of alternate inversion without the offset layers has been used for some years for shipments of spinach, kale, green peas, and similar commodities, and the container damage from load shifting during transit was considerably less than in the upright loads. The tests upon which this report is based were made to compare the alternately inverted crosswise offset method with the conventional upright loading methods and to determine if the inverted load would accomplish the same result for peaches and fresh prunes as it had for other commodities. Where reference is made hereafter to the alternately inverted load in the text, charts, and tables it will be understood to mean the alternately inverted crosswise offset load.

In testing and evaluating the alternately inverted crosswise offset load, the objectives were: (1) To determine the load's comparative ability to withstand normal rail shipping hazards and prevent disarrangement due to compression of the flexible baskets; (2) to determine its comparative ability to reduce squeezing and racking of the baskets, loosening of covers, and disarrangement of the packs; (3) to determine if loading alternate baskets on their covers would cause more pressure bruising of the fruit on the faces of the packs than was normally found in the upright baskets; (4) to determine the comparative cooling rate and final temperature levels of the relatively tight, compact load produced by the alternately inverted method versus the standard upright load; and (5) to determine if, after the loading crews had become proficient in the use of the new method, they might load about the same number of baskets per hour as they could when the standard end-to-end offset loading method was used.

Types of Test and Check Loads

Three types of loading were considered in the shipping tests: The standard end-to-end offset method and the standard crosswise offset method, in both of which the baskets are loaded upright; and the alternately inverted method in which the alternate baskets are loaded upside down. All of the test and check loads were in railroad refrigerator cars. Brief descriptions of the 3 loading patterns are presented in the following paragraphs. (Detailed descriptions of the 3 loading methods for each size of basket are given in the appendix.)

End-to-End Offset Load.--By this method, all baskets are loaded upright on bottoms in continuous rows lengthwise of the car, with the overhanging cover slats arranged diagonally to the side wall of the car to permit tight loading. Baskets in alternate layers in each row offset baskets in the layer below lengthwise of the car, and baskets in the rows after the first row, fit in spaces between baskets in the previous row (figures 4 and 5). The upright end-to-end offset check cars included only 1/2- and 1-bushel baskets.

The end-to-end offset loading pattern can be illustrated by a check carload of 1/2-bushel baskets of peaches for which the usual billed number of baskets is 800. Such a load consists of 8 parallel rows lengthwise of the car, each lengthwise row having 4 layers of 25 baskets each.

Crosswise Offset Load.--By this method, the baskets are loaded in full stacks (the length of one basket) across the car upright on bottoms, alternate layers of each crosswise stack being offset from the side walls of the car, the other layers extending from one side wall of the car to the other. The crosswise offset test cars consisted entirely of peaches in 1/2-bushel and 3/4-bushel baskets.

A typical check car of peaches in 3/4-bushel baskets will serve as the medium for explaining the application of the crosswise offset loading method. The ordinary test load consisted of 594 3/4-bushel baskets in 27 stacks, each consisting of 22 baskets in 4 layers; that is, 2 alternate layers of 6 baskets each across the car from side wall to side wall and 2 alternate layers of 5 baskets each across the car but away from each side wall by about half the top diameter of a basket. A more detailed description of the arrangement of baskets in the crosswise offset load will be found in the appendix.

Alternately Inverted Load.--This method involves loading the baskets in stacks (the length of one basket) across the car, the alternate baskets in each layer of the stacks being inverted or upside down (fig. 7). Baskets in alternate layers in each stack offset baskets in the layers below crosswise of the car and the baskets in the stacks, after the first stack, fit in spaces between baskets in the previous stack. The alternately inverted test cars included peaches in 1/2-, 3/4-, and 1-bushel baskets and fresh prunes in 1/2-bushel baskets.

BN-6052

Figure 4.--Doorway view of an upright end-to-end offset load of 1-bushel baskets of peaches showing arrangement of baskets in load. Note that the points of contact between adjacent baskets in the same layer are confined largely to the top rim area of the baskets, the weakest point of the basket structure.

BN-6053

Figure 5.--Top view of a conventional upright end-to-end offset load of 1-bushel baskets of peaches, showing arrangement of baskets in load. Note limited area of contact between 2 baskets in foreground.

As the test cars of 1/2-bushel baskets of peaches were the most numerous of the alternately inverted loads, a representative test car of these baskets will be used to illustrate the alternately inverted loading pattern. The typical alternately inverted loads of peaches in 1/2-bushel baskets usually contained 868 baskets loaded in 31 stacks crosswise of the car, each stack having 4 layers of 7 baskets each, the alternate baskets of each layer being loaded with the covers up and the remaining ones with the covers down, or inverted.

The following photographs (figs. 6 through 20) show the step-by-step construction of the alternately inverted load for all 3 sizes of baskets. Figures 6, 7, 8, and 9 show 1/2-bushel baskets. The steps in the construction of the alternately inverted load for the 3/4-bushel baskets are pictured in figures 10, 11, 12, and 13. Construction of the load for 1-bushel baskets is shown in figures 14, 15, and 16. The various steps in completing the loads in the doorway area of the cars for all sizes of baskets are shown in figures 17, 18, 19, and 20. (Since completion of the field work for this report, a

BN-6054

Figure 6.--Construction of alternately inverted load of 1/2-bushel baskets. Step 1: First stack built against end wall.

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Figure 7.--Construction of alternately inverted load of 1/2-bushel baskets. Step 2: Three layers of second stack in place against first stack.

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Figure 8.--Construction of alternately inverted load of 1/2-bushel baskets. Step 3: Two layers of third stack in place against second stack.

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Figure 9.--Construction of alternately inverted load of 1/2-bushel baskets. Step 4: One layer of fourth stack and one basket of fifth stack in place. Note stepdown method of placing baskets.

BN-6058

Figure 10.--Construction of alternately inverted load of 3/4-bushel baskets. Step 1: First stack built against end wall.

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Figure 11.--Construction of alternately inverted load of 3/4-bushel baskets. Step 2: Three layers of second stack in place against first stack.

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Figure 12--Construction of alternately inverted load of 3/4-bushel baskets. Step 3: Two layers of third stack in place and additional baskets of the fourth and fifth stacks added to emphasize stepdown method of placing.

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Figure 13.--Construction of alternately inverted load of 3/4-bushel baskets. Step 4: Floor layer of the fourth stack in position.

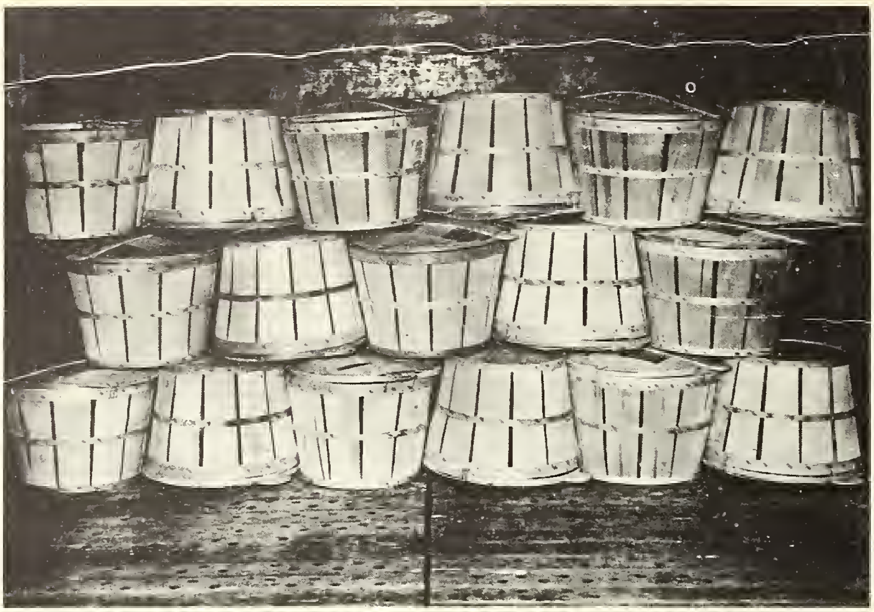

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Figure 14.--Construction of alternately inverted load of 1-bushel baskets. Step 1: First stack built against end wall.

BN-6063

Figure 15.--Construction of alternately inverted load of 1-bushel baskets. Step 2: Two layers of second stack in place against first stack.

BN-6064

Figure 16.--Construction of alternately inverted load of 1-bushel baskets. Step 3: One layer of third stack in place against second stack. Note stepdown method of placing baskets.

BN-6065

Figure 17.--Construction of alternately inverted load. Step 1: Arrangement of first row of baskets in the doorway area. Note doorway protection.

BN-6066

Figure 18.--Construction of alternately inverted load. Step 2: Positioning of additional baskets in the doorway area as loading progresses.

BN-6067

Figure 19.--Construction of alternately inverted load. Step 3: Continuation of loading in the doorway area.

BN-6068

Figure 20.--Construction of alternately inverted load.
Step 4: Completed load in the doorway area.

new method of merging the two sections of the alternately inverted load in the doorway area of the car has been developed by which the load is tightened up considerably more lengthwise of the car, thus increasing the number of baskets per car. A description of this method and provisions for its use are being considered for inclusion in the applicable loading rules tariffs of the railroads.)

Comparison of Test Car Loading Patterns.--Table 5 presents a summary and comparative tabulation of the loading patterns of typical test and check cars of peaches and fresh prunes. That the alternately inverted load is a more compact load than either the upright end-to-end offset or the upright crosswise offset loads is evident from the tabulation. For example, peaches in 1/2-bushel baskets load to 800 baskets in the upright end-to-end offset load, to 806 in the upright crosswise offset load, and to 868 baskets in the alternately inverted load. Thus, the alternately inverted loading pattern provides for 68 and 62 more 1/2-bushel baskets per carload than the respective upright end-to-end offset and the upright crosswise offset loading patterns. The typical alternately inverted load of fresh prunes in 1/2-bushel baskets had 896 baskets, or 32 more than the 864 baskets in the typical upright end-to-end offset car of the same size of basket.

Table 5.--Loading patterns of typical upright and alternately inverted test and check cars of peaches and fresh prunes, based on usual number of baskets billed per car

Loading pattern and basket size	Commodity	Loading pattern per car: Baskets high	Baskets wide	Baskets long	Total baskets per car
		Number	Number	Number	Number
Upright end-to-end offset					
One-half bushels	Peaches	4	8	25	800
One-half bushels	Prunes	4	8	27	2/ 864
One-bushels	Peaches	3	6	22	396
Upright crosswise offset					
One-half bushels	Peaches	4	1/ 7 and 6	31	806
Three-quarter bushels	Peaches	4	1/ 6 and 5	27	594
Alternately inverted					
One-half bushels	Peaches	4	7	31	868
One-half bushels	Prunes	4	7	32	2/ 896
Three-quarter bushels	Peaches	4	6	28	672
One-bushels	Peaches	3	1/ 6 and 5	25	413

1/ Alternate layers.

2/ Half-bushel baskets used for fresh prunes in the West average 1/2 inch less in diameter (14 inches) than those used for peaches in the East (14-1/2 inches). This accounts for the differences in numbers of baskets in the same loading patterns for peaches and prunes.

The 3/4-bushel baskets of peaches loaded by the upright crosswise offset pattern consisted of 594 baskets for the typical carload, compared with 672 baskets in the alternately inverted load, or an increase of 78 baskets. The representative upright end-to-end offset load and the representative alternately inverted load of peaches in bushel baskets contained 396 and 413 baskets, respectively, or an increase of 17 baskets for the alternately inverted loading pattern.

Volume of Experimental Shipments

All the experimental test and check shipments of peaches were made in railroad refrigerator cars in carload lots. The first test shipments were originated in the Georgia-South Carolina area in 1954. There were no shipments from this area in 1955 because a late spring freeze destroyed the crop. The only peach test shipments originating in 1955 were from the Colorado-Idaho area. Shipments were made from both Georgia-South Carolina and the Colorado-Idaho areas in 1956, in which year the tests were completed. Table 6 summarizes the number of peach test shipments in cars originated in the Georgia-South Carolina and Colorado-Idaho areas during the 1954, 1955, and 1956 seasons, and the number of such shipments from which test results were obtained. The latter were the shipments having sufficient data for analysis.

The experimental test shipments of fresh prunes all were made from Idaho during the 1955 and 1956 seasons in carload lots of 1/2-bushel baskets in railroad refrigerator cars. They involved 2 types of loads: End-to-end offset check loads and alternately inverted test loads. The number of cars orginated and the number on which complete test results were developed are shown in table 7.

The variance in basket damage was measured in more than 800 cars of peaches unloaded in 38 markets in Railroad Perishable Inspection Agency territory in 1954. The variance showed that, in testing the alternately inverted load, a minimum of 100 test cars of any 1 type of load and basket would have to be run in order to produce statistically significant data from which valid conclusions could be drawn. 1/ That there was an adequate number of loads to test properly the alternately inverted loading method is demonstrated by the data in table 6. There were 177 alternately inverted test carloads of 1/2-bushel baskets of peaches and 145 alternately inverted test carloads of 1-bushel baskets of peaches from which complete test data were available. To the 177 alternately inverted test carloads of 1/2-bushel baskets of peaches were added the 65 usable alternately inverted test carloads of fresh prunes in 1/2-bushel baskets, making a total of 242 carloads producing test data for this type of basket of this specific loading method.

As is shown in table 6, only 32 alternately inverted test cars of peaches in 3/4-bushel baskets were originated from which test results could be obtained.

1/ A 5-percent sampling error was allowed in developing the experimental design for the study of this type of load. The probability that 100 test shipments would produce results not statistically significant is estimated to be 1 in 20.

Table 6.--Number of test and check cars of peaches in baskets originated, and number of test and check cars originated from which test results were obtained, by origin area, season, basket size, and type of load

Origin area and seasons	Cars originated				Cars originated from which test results were obtained			
	1/2 bu.	3/4 bu.	1 bu.	Total	1/2 bu.	3/4 bu.	1 bu.	Total
	Number	Number	Number	Number	Number	Number	Number	Number
	End-to-end offset (upright) check loads							
Georgia-South Carolina								
1954	9	-	-	9	9	-	-	9
1956	18	-	29	47	17	-	23	40
Total	27	-	29	56	26	-	23	49
	Crosswise offset (upright) check loads							
Georgia-South Carolina								
1954	17	-	-	17	17	-	-	17
1956	-	30	-	30	-	28	-	28
Total	17	30	-	47	17	28	-	45
	Alternately inverted test loads							
Colorado-Idaho								
1955	-	-	17	17	-	-	17	17
1956	-	-	14	14	-	-	14	14
Total	-	-	31	31	-	-	31	31
Georgia-South Carolina								
1954	6	-	7	13	6	-	7	13
1956	175	32	134	341	171	32	107	310
Total	181	32	141	354	177	32	114	323
Total - 2 areas	181	32	172	385	177	32	145	354
	All test and check loads							
All areas - total	225	62	201	488	220	60	168	448

Table 7.--Number of test and check cars of fresh prunes originated in Idaho and inspected at terminal markets, by type of load, 1955-1956

Seasons	Cars originated			Cars originated from which test results were obtained		
	End-to-end offset loads	A. I. loads 1/	Total	End-to-end offset loads	A. I. loads	Total
	Number	Number	Number	Number	Number	Number
1955..	7	23	30	7	21	28
1956..	12	101	113	5	44	49
Total..	19	124	143	12	65	77

1/ Alternately inverted loads.

Although this is substantially less than the required 100-car minimum test sample referred to in the preceding paragraph, the results obtained for these 32 cars may be considered significant, since the 3/4-bushel baskets were of the same general shape and construction as the 1/2- and 1-bushel baskets.

Methods of Obtaining Test Data

The tests were conducted cooperatively by representatives of the Freight Loading and Container Bureau of the Association of American Railroads, the American Veneer Package Association, the Agricultural Marketing Service of the U. S. Department of Agriculture, the Railroad Perishable Inspection Agency, and the Western Weighing and Inspection Bureau. The Agricultural Marketing Service provided standard forms for an Origin Loading Report and a Destination Inspection Report, so that the test data could be reported with such uniformity and completeness as to permit accurate comparisons of the performance of the upright and alternately inverted loads. The conditions under which the tests were conducted were kept as comparable as possible.

The test cars were loaded or loading was supervised jointly by representatives of the Freight Loading and Container Bureau of the Association of American Railroads, the American Veneer Package Association, the Department of Agriculture, and the railroads. An Origin Loading Report was prepared for each test and check car as it was loaded. The report included information on origin, destination, consignor, consignee, and routing of the shipment; protective services; condition and features of the baskets; variety; and other pertinent factors. Impact registers to measure the number and intensity of the lengthwise impacts transmitted to the loads were installed in, and records were obtained on, 64 peach test and check cars.

At destination, all test cars, wherever possible, were inspected by employees of the Railroad Perishable Inspection Agency or the Western Weighing

and Inspection Bureau for basket breakage, and by inspectors of the Fresh Products Standardization and Inspection Branch of the Agricultural Marketing Service for bruising and condition of the fruit. Cars destined to Canada were inspected by employees of the Canadian railroads for basket breakage. The results of these inspections were recorded for each test and check car on the Destination Inspection Report, which provided for information on the identification of the shipment; container type and size; temperatures; type, construction, and condition of the load; and other pertinent data.

RESULTS

Basket Damage

The results of the tests with respect to basket damage are shown in tables 8, 9, 10, and 11, comparing the transit damage to baskets in rail shipments of peaches from the Georgia-South Carolina and Colorado-Idaho areas for 1954, 1955, and 1956. In table 12, a similar comparison is made for rail shipments of fresh prunes from Idaho for 1955 and 1956.

Half-Bushel Baskets.--The total test and check cars of peaches in 1/2-bushel baskets for the 1954 and 1956 seasons combined consisted of 43 carloads loaded upright, including 26 by the end-to-end offset method and 17 by the crosswise offset method, and 177 alternately inverted carloads, all of which originated in the Georgia-South Carolina area.

It will be observed from table 8 that the alternately inverted loading method effected reductions of 28.3 baskets, or 71.1 percent, in the number of baskets per car requiring recoopering, including baskets delivered in bad order, and 10.3 baskets, or 58.5 percent, in the number of baskets per car delivered in bad order, which could not be recoopered. The types of basket damage in the 1/2-bushel shipments are reported in table 13. These data indicate that the alternately inverted loading produced significant reductions in the proportions of baskets with broken or loose cover loops or handles and baskets with broken or buckled covers. A comparison of the percentage ranges of basket damage for upright and alternately inverted carloads of peaches appears in table 25 in the appendix.

The total test and check cars of fresh prunes in 1/2-bushel baskets for the 1955 and 1956 seasons combined, all of which came from Idaho, consisted of 77 cars, of which 12 were loaded by the upright end-to-end offset method and 65 by the alternately inverted method. Table 12 shows that the alternately inverted loading brought about reductions of 24.9 baskets, or 62.1 percent, in the number of baskets per car requiring recoopering, including bad order baskets, and of 14.8 baskets, or 58.3 percent, in the number of baskets per car delivered in bad order.

Three-Quarter Bushel Baskets.--The loads of 3/4-bushel baskets of peaches, from which test data were derived, originated in the Georgia-South Carolina area in the 1956 season. They totalled 60 cars, of which 28 check cars had upright crosswise offset loads and 32 test cars had alternately inverted loads.

Table 8.--Comparative basket damage in rail shipments of peaches in 1/2-bushel baskets from Georgia and South Carolina, by type of load, 1954 and 1956

Type of load and shipping area	Season	Total cars inspected	Total baskets in cars inspected	Basket damage: Baskets requiring recoopering: Number of baskets	Basket damage: Baskets requiring recoopering: Percent of total baskets	Basket damage: Baskets in bad order: Number of baskets	Basket damage: Baskets in bad order: Percent of total baskets
		Number	Number	Number	Percent	Number	Percent
Upright end-to-end offset loads							
Georgia and South Carolina	1954	9	7,376	330	4.5	155	2.1
Average per car			820	36.7		17.2	
Georgia and South Carolina	1956	17	13,820	316	2.3	154	1.1
Average per car			813	18.6		9.1	
Total, both seasons	1954	26	21,196	646	3.0	309	1.5
Average per car	and 1956		815	24.8		11.9	
Upright crosswise offset loads							
Georgia and South Carolina	1954	17	13,624	1,064	7.8	448	3.3
Average per car			801	62.6		26.4	
Total upright loads	1954	43	34,820	1,710	4.9	757	2.2
Average per car	and 1956		810	39.8		17.6	
Alternately inverted loads							
Georgia and South Carolina	1954	6	5,204	47	0.9	29	0.6
Average per car			867	7.8		4.8	
Georgia and South Carolina	1956	171	148,239	1,993	1.3	1,256	0.8
Average per car			867	11.7		7.3	
All alternately inverted loads	1954	177	153,443	2,040	1.3	1,285	0.8
Average per car	and 1956		867	11.5		7.3	
Average reduction in damaged baskets per car, alternately inverted loads compared with upright loads				28.3	71.1	10.3	58.5

Table 9.--Comparative basket damage in rail shipments of peaches in 3/4-bushel baskets from Georgia and South Carolina, by type of load, 1956

Type of load and shipping area	Total cars inspected	Total baskets in cars inspected	Basket damage: Baskets requiring recoopering: Number of baskets	Basket damage: Baskets requiring recoopering: Percent of total baskets	Basket damage: Baskets in bad order: Number of baskets	Basket damage: Baskets in bad order: Percent of total baskets
	Number	Number	Number	Percent	Number	Percent
Upright crosswise offset loads						
Georgia and South Carolina	28	17,302	1,002	5.8	474	2.7
Average per car		618	35.8		16.9	
Alternately inverted loads						
Georgia and South Carolina	32	21,500	845	3.9	431	2.0
Average per car		672	26.4		13.5	
Average reduction in damaged baskets per car, alternately inverted loads compared with upright loads			9.4	26.3	3.4	20.1

Table 10.--Comparative basket damage in rail shipments of peaches in 1-bushel baskets from Georgia, South Carolina, Colorado, and Idaho, by type of load, 1954, 1955, 1956

Type of load and shipping area	Season	Total test cars inspected	Total baskets in cars inspected	Basket damage: Baskets requiring recoopering: Number of baskets	Basket damage: Baskets requiring recoopering: Percent of total baskets	Basket damage: Baskets in bad order: Number of baskets	Basket damage: Baskets in bad order: Percent of total baskets
		Number	Number	Number	Percent	Number	Percent
Upright end-to-end offset loads							
Georgia and South Carolina	1956	23	9,108	1,486	16.3	1,108	12.2
Average per car			396	64.6		48.2	
Alternately inverted loads							
Georgia and South Carolina	1954	7	2,909	125	4.3	101	3.5
Average per car			416	17.9		14.4	
Colorado and Idaho	1955	17	7,021	66	0.9	20	0.3
Average per car			413	3.9		1.2	
Georgia and South Carolina	1956	107	44,240	2,352	5.3	1,773	4.0
Average per car			413	22.0		16.6	
Colorado	1956	14	5,780	128	2.2	40	0.7
Average per car			413	9.1		2.9	
All alternately inverted loads							
Georgia, South Carolina, Colorado, and Idaho	1954	145	59,950	2,671	4.5	1,934	3.2
Average per car	and 1956		413	18.4		13.3	
Average reduction in damaged baskets per car, alternately inverted loads compared with upright loads				46.2	71.5	34.9	72.4

Table 11.--Comparative basket damage in rail shipments of peaches in all sizes of baskets from Georgia, South Carolina, Colorado, and Idaho, by type of load, 1954 and 1956

Type of load and shipping area	Season	Total cars inspected	Total baskets in cars inspected	Basket damage: Baskets requiring recoopering: Number of baskets	Basket damage: Baskets requiring recoopering: Percent of total baskets	Basket damage: Baskets in bad order: Number of baskets	Basket damage: Baskets in bad order: Percent of total baskets
		Number	Number	Number	Percent	Number	Percent
All standard upright loads							
Georgia and South Carolina	1954 and 1956	94	61,230	4,198	6.9	2,339	3.8
Average per car				44.7		24.9	
All alternately inverted loads							
Georgia, South Carolina, Colorado, and Idaho	1954 and 1956	354	234,893	5,556	2.4	3,650	1.6
Average per car				15.7		10.3	
Average reduction in baskets damaged per car, alternately inverted loads compared with upright loads				29.0	64.9	14.6	58.6

Table 12.--Comparative damaged baskets in rail shipments of fresh prunes from Idaho in 1/2-bushel baskets, by type of load, 1955 and 1956

Type of load and shipping area	Season	Total cars inspected	Total baskets in cars inspected	Basket damage: Baskets requiring recoopering: Number of baskets	Basket damage: Baskets requiring recoopering: Percent of total baskets	Basket damage: Baskets in bad order: Number of baskets	Basket damage: Baskets in bad order: Percent of total baskets
		Number	Number	Number	Percent	Number	Percent
Upright end-to-end offset loads	1955	7	6,048	302	5.0	149	2.5
Average per car			864	43.1		21.3	
	1956	5	4,320	179	4.1	156	3.6
Average per car			864	35.8		31.2	
Total-both seasons	1955 and 1956	12	10,368	481	4.6	305	2.9
Average per car			864	40.1		25.4	
Alternately inverted loads	1955	21	18,816	236	1.3	183	1.0
Average per car			896	11.2		8.7	
	1956	44	39,424	749	1.9	507	1.3
Average per car			896	17.0		11.5	
Total-both seasons	1955 and 1956	65	58,240	985	1.7	690	1.2
Average per car			896	15.2		10.6	
Average reduction in damaged baskets per car, alternately inverted loads compared with end-to-end offset loads				24.9	62.1	14.8	58.3

Table 9 shows that in the alternately inverted loads, compared with the upright loads, there were reductions of 9.4 baskets, or 26.3 percent, in the number of baskets per car requiring recoopering, including bad-order baskets, and 3.4 baskets, or 20.1 percent, in the number of baskets per car delivered in bad order which could not be recoopered. A comparison of the percentage ranges of basket damage for upright and alternately inverted carloads of peaches in 3/4-bushel baskets is made in table 25 in the appendix.

The number of baskets having broken or buckled covers, racking, or loose or broken bottoms was smaller in the alternately inverted loads than in the upright loads, as shown in table 13, which enumerates the types of basket damage. While the alternately inverted loads appeared to have an excessive number of "squeezed" baskets (squeezed out of their round shape), this may have resulted from rough handling during loading at the origin point rather than from damage in transit. Nevertheless, the alternately inverted loads averaged 41.5 percent fewer baskets per car requiring recoopering than did the upright loads.

One-Bushel Baskets.--Table 10 analyzes the test results on shipments of peaches in 1-bushel baskets. The data are based on 23 upright end-to-end offset check loads from the Georgia-South Carolina area in 1956, and 145 alternately inverted loads, of which 114 originated in the Georgia-South Carolina area in 1954 and 1956 and 31 originated in Colorado and Idaho in 1955 and 1956. Comparatively, the alternately inverted loads contained 46.2 fewer baskets per car requiring recoopering, including bad-order baskets, and 34.9 fewer bad-order baskets per car, than the upright end-to-end offset loads. These were reductions of 71.5 and 72.4 percent, respectively. Table 25, in the appendix, contains a comparison of the percentage ranges of basket damage for upright and alternately inverted carloads of peaches in 1-bushel baskets.

Table 13 shows that the alternately inverted loads had appreciably fewer baskets per car than the upright loads in the categories of squeezed baskets and unspecified types of damage, and a slight reduction in the number of baskets per car with broken or loose loops or handles. The results for the other 5 types of basket damage favored the upright loads. However, the upright loads had an average of 45.4 baskets per car requiring recoopering compared to only 28.5 baskets, or 37.2 percent less, for the alternately inverted loads.

All Sizes of Baskets.--Another measure of the effectiveness of the alternately inverted loading method in reducing basket damage is provided by comparing the basket damage for all sizes of baskets of peaches loaded by the upright and alternately inverted methods. Table 11, a summary of tables 8, 9, and 10, makes such a comparison on 94 upright loads from the Georgia-South Carolina area in the 1954 and 1956 seasons and 354 alternately inverted loads from the Georgia-South Carolina and Colorado-Idaho areas in the 1954, 1955, and 1956 seasons.

The alternately inverted loads, compared with the upright loads, had 29 fewer baskets per car requiring recoopering, and 14.6 fewer baskets per car

Table 13.--Types of basket damage in rail shipments of peaches from Georgia and South Carolina, by type of load and size of basket, 1956 season

Types of basket damage	Half-bushel baskets				Three-quarter-bushel baskets				One-bushel baskets			
	Upright loads (15 cars) 1/		Alternately inverted loads (132 cars)		Upright loads (22 cars) 2/		Alternately inverted loads (24 cars)		Upright loads (14 cars) 1/		Alternately inverted loads (56 cars)	
	Average baskets per car	Percent of total damage	Average baskets per car	Percent of total damage	Average baskets per car	Percent of total damage	Average baskets per car	Percent of total damage	Average baskets per car	Percent of total damage	Average baskets per car	Percent of total damage
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Broken or buckled covers	3.3	19.3	0.7	6.4	6.4	19.6	0.8	4.4	1.6	3.5	2.4	8.3
Cut staves	0.3	1.6	1.3	11.0	2.3	8.5	2.2	11.4	8.7	19.2	5.7	20.1
Racked baskets	1.3	7.7	1.1	9.0	5.5	16.9	1.1	5.5	0.8	1.7	5.6	19.8
Broken hoops	0.4	2.3	0.5	4.5	2.1	6.6	2.1	11.0	0.1	0.1	2.3	8.1
Loose or broken bottoms	0.3	1.9	0.4	3.4	0.6	1.8	0.1	0.7	2.0	4.6	2.8	9.7
Squeezed baskets	3.9	22.8	3.5	29.4	7.6	23.5	8.3	43.9	22.1	48.6	7.1	24.9
Broken or loose cover loops or handles	7.7	44.4	2.3	19.6	6.5	20.2	4.1	21.3	3.4	7.5	2.1	7.4
Other (unspecified)	-	-	2.0	16.7	1.0	2.9	0.3	1.8	6.7	14.8	0.5	1.7
Total-all types damage	17.2	100.0	11.8	100.0	32.5	100.0	19.0	100.0	45.4	100.0	28.5	100.0

1/ Upright end-to-end offset loads.
2/ Upright crosswise offset loads.

delivered in bad order, which were reductions of 64.9 and 58.6 percent, respectively. The percentage ranges of basket damage between upright loads and alternately inverted loads of all sizes of baskets are shown in table 25 in the appendix.

Overall Basket Damage Results.--Few alternately inverted loads of peaches were inspected by the Railroad Perishable Inspection Agency before the 1956 season. The Agency's data for cars unloaded in 38 markets during the 1956 season provided the best source for further comparisons of basket damage in upright loads and in alternately inverted loads. The basket damage found by the Agency during the 1956 season is shown in tables 14, 15, and 16.

Table 14 compares the basket damage in 1/2-bushel baskets on 677 upright and 188 alternately inverted loads. Damage in the latter was less by 20.8 baskets, or 60.1 percent, in number of baskets per car requiring recoopering, and by 12 baskets, or 61.8 percent, in bad-order baskets per car.

The basket damage for the 3/4-bushel baskets, as shown in table 15, covers 366 upright loads and 36 alternately inverted loads. The alternately inverted loads had 10.2 fewer baskets per car requiring recoopering and 5.7 fewer in bad order, reductions of 29.6 and 29.5 percent, respectively.

In the 795 upright loads and the 99 alternately inverted loads of 1-bushel baskets covered by table 16, the latter type of load had 11.8 baskets, or 35.4 percent, fewer baskets per car requiring recoopering, and 10.6 baskets, or 50.5 percent, fewer bad-order baskets per car.

In 38 markets in the Railroad Perishable Inspection Territory during the 1956 season, 460 upright loads and 534 alternately inverted loads of fresh prunes in 1/2-bushel baskets were unloaded and inspected. The basket damage on these shipments is shown in table 17. In the alternately inverted loads, compared with upright loads, 18 fewer baskets per car required recoopering, a reduction of 29.6 percent, and 17 fewer baskets, or 38.2 percent fewer, were in bad order.

The basket damage data of the Railroad Perishable Inspection Agency for upright and alternately inverted loads differ from the figures previously shown for the test and check loads of peaches and fresh prunes. This variation is due largely to difference in the numbers of cars in each comparison. However, both sets of data show substantial reductions in basket damage in alternately inverted loads.

Reasons for Reduced Basket Damage in Alternately Inverted Loads.--The reduction of basket breakage and damage in the inverted load resulted primarily from its greater solidity and its consequent resistance to lengthwise impacts that ordinarily cause basket breakage in the conventional upright load. Because of the semiconical shape of the baskets, the side-to-side area of contact between the baskets in the conventional upright load is confined entirely to the top rims of the baskets, or the edges of the basket covers. The rim area is usually the most flexible part of the container. This weakness is even more pronounced when the covers of the baskets are not tightly fitted and properly secured.

Table 14.--Comparative basket damage in rail shipments of peaches in 1/2-bushel baskets unloaded in 38 markets, by type of load, 1956 1/

Type of load	Total cars inspected	Total baskets in cars inspected	Basket damage: Baskets requiring recoopering: Number of baskets	Baskets requiring recoopering: Average per car	Baskets requiring recoopering: Percent of total baskets	Baskets in bad order: Number of baskets	Baskets in bad order: Average per car	Baskets in bad order: Percent of total baskets
	Number	Number	Number	Number	Percent	Number	Number	Percent
Upright end-to-end offset......	629	503,200	22,259	35.4	4.4	12,620	20.0	2.5
Upright crosswise offset.......	48	38,400	1,180	24.6	3.1	483	10.0	1.3
All upright....................	677	541,600	23,439	34.6	4.3	13,103	19.4	2.4
Alternately inverted...........	188	163,184	2,593	13.8	1.6	1,393	7.4	0.8
Average reduction in damaged baskets per car, alternately inverted loads compared with all upright loads.............				20.8	60.1		12.0	61.8

1/ Reports of Railroad Perishable Inspection Agency.

Table 15.--Comparative basket damage in rail shipments of peaches in 3/4-bushel baskets unloaded in 38 markets, by type of load, 1956 1/

Type of load	Total cars inspected	Total baskets in cars inspected	Basket damage: Baskets requiring recoopering: Number of baskets	Basket damage: Baskets requiring recoopering: Average per car	Basket damage: Baskets requiring recoopering: Percent of total baskets	Basket damage: Baskets in bad order: Number of baskets	Basket damage: Baskets in bad order: Average per car	Basket damage: Baskets in bad order: Percent of total baskets
	Number	Number	Number	Number	Percent	Number	Number	Percent
Upright end-to-end offset	99	15,806	3,024	30.5	5.1	1,394	14.1	2.4
Upright crosswise offset	267	158,598	9,608	36.0	6.1	5,687	21.3	3.6
All upright	366	217,404	12,632	34.5	5.8	7,081	19.3	3.3
Alternately inverted	36	24,192	873	24.3	3.6	488	13.6	2.0
Average reduction in damaged baskets per car, alternately inverted loads compared with all upright loads				10.2	29.6		5.7	29.5

1/ Reports of Railroad Perishable Inspection Agency.

Table 16.--Comparative basket damage in rail shipments of peaches in 1-bushel baskets unloaded in 38 markets, by type of load, 1956 1/

Type of load	Total cars inspected	Total baskets in cars inspected	Basket damage: Baskets requiring recoopering: Number of baskets	Basket damage: Baskets requiring recoopering: Average per car	Basket damage: Baskets requiring recoopering: Percent of total baskets	Basket damage: Baskets in bad order: Number of baskets	Basket damage: Baskets in bad order: Average per car	Basket damage: Baskets in bad order: Percent of total baskets
	Number	Number	Number	Number	Percent	Number	Number	Percent
Upright end-to-end offset	781	309,276	26,257	33.6	8.5	16,580	21.2	5.4
Upright crosswise offset	14	5,544	199	14.2	3.6	102	7.3	1.8
All upright	795	314,820	26,456	33.3	8.4	16,682	21.0	5.3
Alternately inverted	99	40,887	2,133	21.5	5.2	1,003	10.4	2.5
Average reduction in damaged baskets per car, alternately inverted loads compared with all upright loads				11.8	35.4		10.6	50.5

1/ Reports of Railroad Perishable Inspection Agency.

Table 17.--Comparative basket damage in rail shipments of fresh prunes or plums in 1/2-bushel baskets unloaded in 38 markets, by type of load, 1956 1/

Type of load	Total cars inspected	Total baskets in cars inspected	Basket damage: Baskets requiring recoopering: Number of baskets	Basket damage: Baskets requiring recoopering: Average per car	Basket damage: Baskets requiring recoopering: Percent of total baskets	Basket damage: Baskets in bad order: Number of baskets	Basket damage: Baskets in bad order: Average per car	Basket damage: Baskets in bad order: Percent of total baskets
	Number	Number	Number	Number	Percent	Number	Number	Percent
Upright end-to-end offset	441	381,024	26,508	60.1	7.0	19,616	44.5	5.1
Upright crosswise offset	19	15,200	1,440	75.8	9.5	832	43.8	5.5
All upright	460	396,244	27,948	60.8	7.1	20,448	44.5	5.2
Alternately inverted	534	478,464	22,871	42.8	4.8	14,682	27.5	3.1
Average reduction in damaged baskets per car, alternately inverted loads as compared with all upright loads				18.0	29.6		17.0	38.2

1/ Reports of Railroad Perishable Inspection Agency.

The inverted load takes advantage of the shape of the baskets in that they are fitted together tightly to produce a solid, compact load. This loading pattern, in which the baskets in each stack are nested in the recesses formed between two baskets in the preceding stack, greatly increases the area of contact between the baskets; the force of the lengthwise thrusts received by the load is therefore dispersed over a greater area of basket surface. Consequently, there is less racking, squeezing, and other damage to the baskets, because there is greater resistance of the load to the normal hazards of rail transportation.

Fruit Bruising

Proper evaluation of the alternately inverted loading method for shipments of peaches and fresh prunes in tub baskets also involves the effect of that loading method on fruit bruising. When packed and shipped, peaches are usually at the hard ripe to firm ripe stage of maturity, and a few may have advanced to firm ripe. However, peaches are naturally tender and susceptible to bruising. Fresh prunes also are susceptible to bruising, although not to the same extent as peaches. Both types of fruit require much care through all stages of handling and transportation to protect them from abnormal mechanical damage.

While some bruising occurs during transportation, there are other contributing factors. For example, bruising may also result from (a) handling of the fruit from the field into the packinghouse; (b) grading operations in the packinghouse; (c) the amount of pressure to which the fruit is subjected during packing, especially in applying and fastening the basket covers; (d) increased pressure on the fruit at the bulge in the face of the pack, caused by applying and forcing the cover down into place, when the bulge is somewhat higher than usual; (e) the degree of maturity, involving particularly the pressure of hard peaches against firm ripe or soft ripe peaches when both are packed in the same basket; (f) unnecessary roughness in dropping, throwing, or forcing baskets into place during the loading of cars. These conditions may vary greatly from one shipper or packer to another, or for a single shipper or packer during the same or different seasons, or at different times during the same season.

Condition inspections for fruit bruising were made on as many test and check cars as possible by Department of Agriculture inspectors. Inspection reports of the Railroad Perishable Inspection Agency and the Western Weighing and Inspection Bureau provided supplementary information on bruising. The Georgia-South Carolina area in 1954 and 1956 and the Colorado-Idaho area in 1955 and 1956 provided a total of 288 test and check shipments of peaches in refrigerator cars on which data on bruising were obtained. This group consisted of 141 cars of 1/2-bushel baskets, of which 15 were upright end-to-end offset loads and 126 alternately inverted loads; 50 cars of 3/4-bushel baskets, of which 28 were upright crosswise offset loads and 22 alternately inverted loads; and 97 cars of 1-bushel baskets, of which 12 were upright end-to-end offset loads and 85 alternately inverted loads.

The test shipments of fresh prunes in refrigerator cars on which data on bruising were obtained moved from Idaho during 1956 in 1/2-bushel baskets only. They comprised 4 upright end-to-end offset loaded cars and 16 alternately inverted loaded cars.

The comparison of fruit bruising in the upright versus the inverted baskets in the alternately inverted load is of special significance. As half of the baskets in each alternately inverted loads are in the same upright position as they are in the conventional upright loads, a direct comparison of bruising between upright and inverted baskets on the same fruit, with the same degree of maturity, in the same car, loaded by the same loading crews at the same packinghouse, was possible in each test load.

The inspections for bruising in the comparisons which follow were made on fruit in undamaged baskets only. The purpose was to determine whether inverting the baskets would cause any appreciable increase in fruit bruising in otherwise undamaged baskets.

It should be emphasized, however, that the bad-order baskets and those requiring recoopering before reuse contained considerable bruised fruit. When baskets were recoopered, all the bruised fruit was removed and replaced with sound fruit. This resulted in a number of empty and partly empty containers after recoopering, and these baskets are included in the total bad-order count. In addition, many of the bad-order baskets which remained after a considerable number of baskets had been recoopered and repacked, contained some discarded and bruised fruit. Data in the preceding section of this report showed that the alternately inverted loading method significantly reduced overall basket damage, which indicates that this loading method also can be instrumental in substantially reducing fruit bruising losses.

Half-Bushel Baskets.--Bruising data on 1/2-bushel baskets of peaches were analyzed for 15 upright end-to-end offset check loads in 1956 and 126 alternately inverted loads in 1954 and 1956 from the Georgia-South Carolina area. The slight difference in bruising rates for the 2 types of loads, as shown in table 26 in the appendix, is of no significance. The comparison of the upright and inverted baskets in the alternately inverted loads in figure 21 also indicates that inverting the baskets caused no increase in fruit bruising. Percentage ranges in fruit bruising for the upright and alternately inverted 1/2-bushel loads appear in table 18.

Test data for bruising in 1/2-bushel-basket loads of fresh prunes were available on 4 upright end-to-end offset check loads and 16 alternately inverted loads originating in Idaho in 1955, as shown in table 30 in the appendix. There was no substantial difference in the bruising rates for the 2 types of loads. The comparison in figure 22 of bruising rates in the upright and the inverted baskets in the alternately inverted loads shows there was somewhat more slight bruising in the inverted baskets. However, this difference is not of much importance, as minor bruising is not regarded as significant and does not affect the grade of the fruit. In the categories of "damage by bruising" and "serious bruising," there was little difference between the upright and inverted baskets.

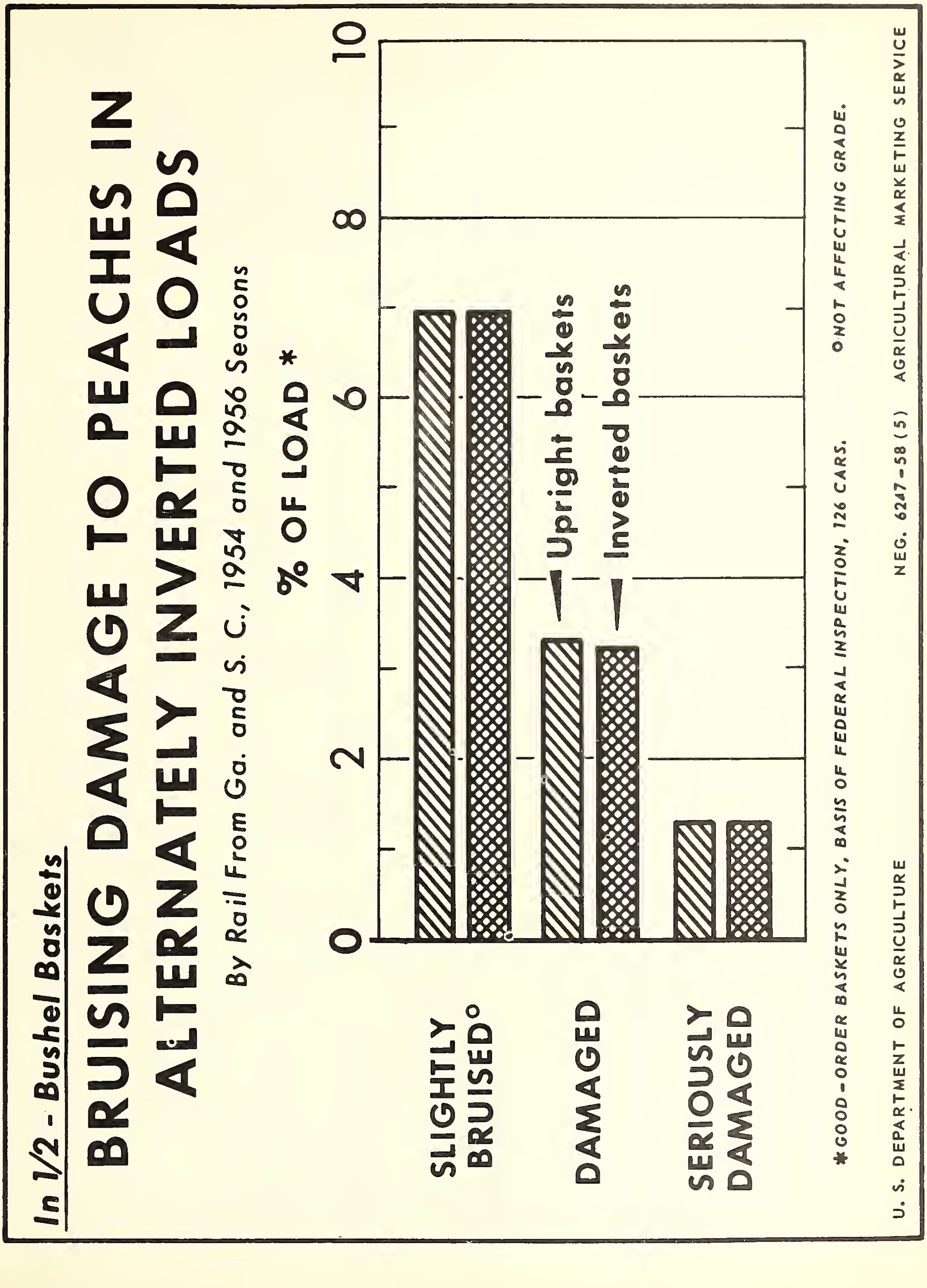
In 1/2 - Bushel Baskets
BRUISING DAMAGE TO PEACHES IN ALTERNATELY INVERTED LOADS
By Rail From Ga. and S. C., 1954 and 1956 Seasons
% OF LOAD *
0
2
4
6
8
10
SLIGHTLY BRUISED°
DAMAGED
SERIOUSLY DAMAGED
Upright baskets
Inverted baskets
*GOOD-ORDER BASKETS ONLY, BASIS OF FEDERAL INSPECTION, 126 CARS.
°NOT AFFECTING GRADE.
U. S. DEPARTMENT OF AGRICULTURE
NEG. 6247-58 (5)
AGRICULTURAL MARKETING SERVICE

Figure 21

Table 18.--Range of fruit bruising found in peach shipments from Georgia and South Carolina, by size of basket and type of load, 1956

Size of basket and type of load	Test cars	Slight bruising 1/		Damage by bruising		Serious bruising	
		Cars with 0-10% damage	Cars with more than 10% damage	Cars with 0-4% damage	Cars with more than 4% damage	Cars with 0-2% damage	Cars with more than 2% damage
	No.	Percent	Percent	Percent	Percent	Percent	Percent
Half-bushel baskets							
Upright loads	15	86.7	13.3	73.3	26.7	86.7	13.3
Alternately inverted loads	122	73.8	26.2	61.5	38.5	69.7	30.3
Three-quarter-bushel baskets							
Upright loads	28	71.4	28.6	57.1	42.9	57.1	42.9
Alternately inverted loads	22	77.3	22.7	59.1	40.9	59.1	40.9
One-bushel baskets							
Upright loads	12	83.3	16.7	83.3	16.7	91.7	8.3
Alternately inverted loads	66	90.9	9.1	89.4	10.6	87.9	12.1
All sizes of baskets							
Upright loads	55	78.2	21.8	67.3	32.7	72.7	27.3
Alternately inverted loads	210	79.5	20.5	70.0	30.0	74.3	25.7

1/ Not affecting grade.

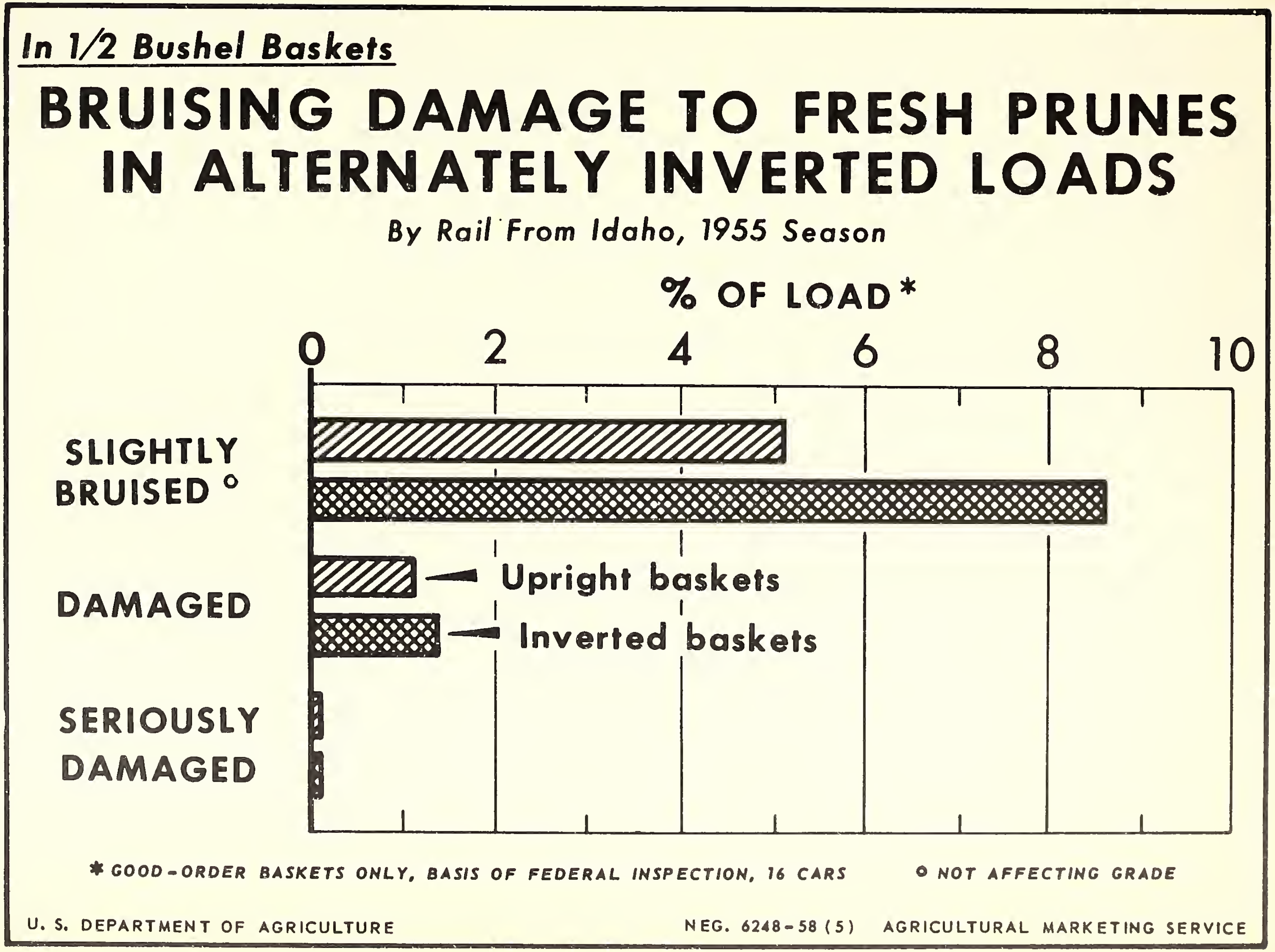
In 1/2 Bushel Baskets
BRUISING DAMAGE TO FRESH PRUNES IN ALTERNATELY INVERTED LOADS
By Rail From Idaho, 1955 Season
% OF LOAD *
0
2
4
6
8
10
SLIGHTLY BRUISED °
DAMAGED
SERIOUSLY DAMAGED
Upright baskets
Inverted baskets
* GOOD-ORDER BASKETS ONLY, BASIS OF FEDERAL INSPECTION, 16 CARS
° NOT AFFECTING GRADE
U. S. DEPARTMENT OF AGRICULTURE
NEG. 6248-58 (5)
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Figure 22

Three-Quarter-Bushel Baskets.--All of the 3/4-bushel-basket shipments of peaches on which bruising data were available originated in the Georgia-South Carolina area in 1956, comprising 28 upright crosswise offset check loads and 22 alternately inverted loads, as shown in table 27 in the appendix. A comparison of bruising in the upright and the inverted baskets in the alternately inverted loads appears in figure 23. The bruising rates are about equal, indicating that inverted loading had no adverse effect on bruising. The percentage ranges of fruit bruising for these same loads, in table 18, show no substantial difference between the upright and alternately inverted loads.

One-Bushel Baskets.--The results of the examination of fruit bruising in 1-bushel-basket loads of peaches appear in table 28 in the appendix. The data cover 12 upright end-to-end offset check loads from the Georgia-South Carolina area in 1956, and 85 alternately inverted loads from the Georgia-South Carolina and Colorado-Idaho areas in 1954, 1955, and 1956. The bruising in the upright and inverted baskets of the alternately inverted loads is compared in figure 24. It is apparent that there was no substantial difference in the bruising rates between the upright and the alternately inverted loads, and between the upright and the inverted baskets of the alternately inverted loads. A similar conclusion may be drawn from the comparison in table 18 of the percentage ranges of fruit bruising for upright and alternately inverted loads of peaches in 1-bushel baskets from the Georgia-South Carolina area in 1956.

All Sizes of Baskets.--To determine the overall performance of the alternately inverted loading method with respect to bruising damage, all the test groups of 1/2-, 3/4-, and 1-bushel loads of peaches in the upright loaded cars were combined and compared with a similar combination of peach loads in the alternately inverted loaded cars, as shown in table 29 in the appendix. This comparison covered 55 upright loads from the Georgia-South Carolina area during the 1956 season and 233 alternately inverted loads from the Georgia-South Carolina and Colorado-Idaho areas during the 1954, 1955, and 1956 seasons.

It is apparent that the differences in bruising rates between the upright loads and the alternately inverted loads were so slight as to have no real significance. The same thing holds true in comparing the bruising rates of the upright and the inverted baskets in the alternately inverted loads as shown in figure 26 and in the tabulation of the percentage ranges of fruit bruising in table 18. (See also fig. 25.)

Time Requirements by Type of Load

Time studies of loading operations involving loading crews proficient in the use of both the standard upright and the alternately inverted methods of loading peaches were made in Georgia and South Carolina during the 1956 season. The results of these studies are given in table 19.

Most of the packing sheds observed had two 2-man teams loading the individual refrigerator cars. Sometimes one 2-man team was used for loading cars with a size or grade of fruit in limited supply, and the flow of baskets to the car for loading was slow. In such instances, there was considerable waiting time on the part of the loading crew.

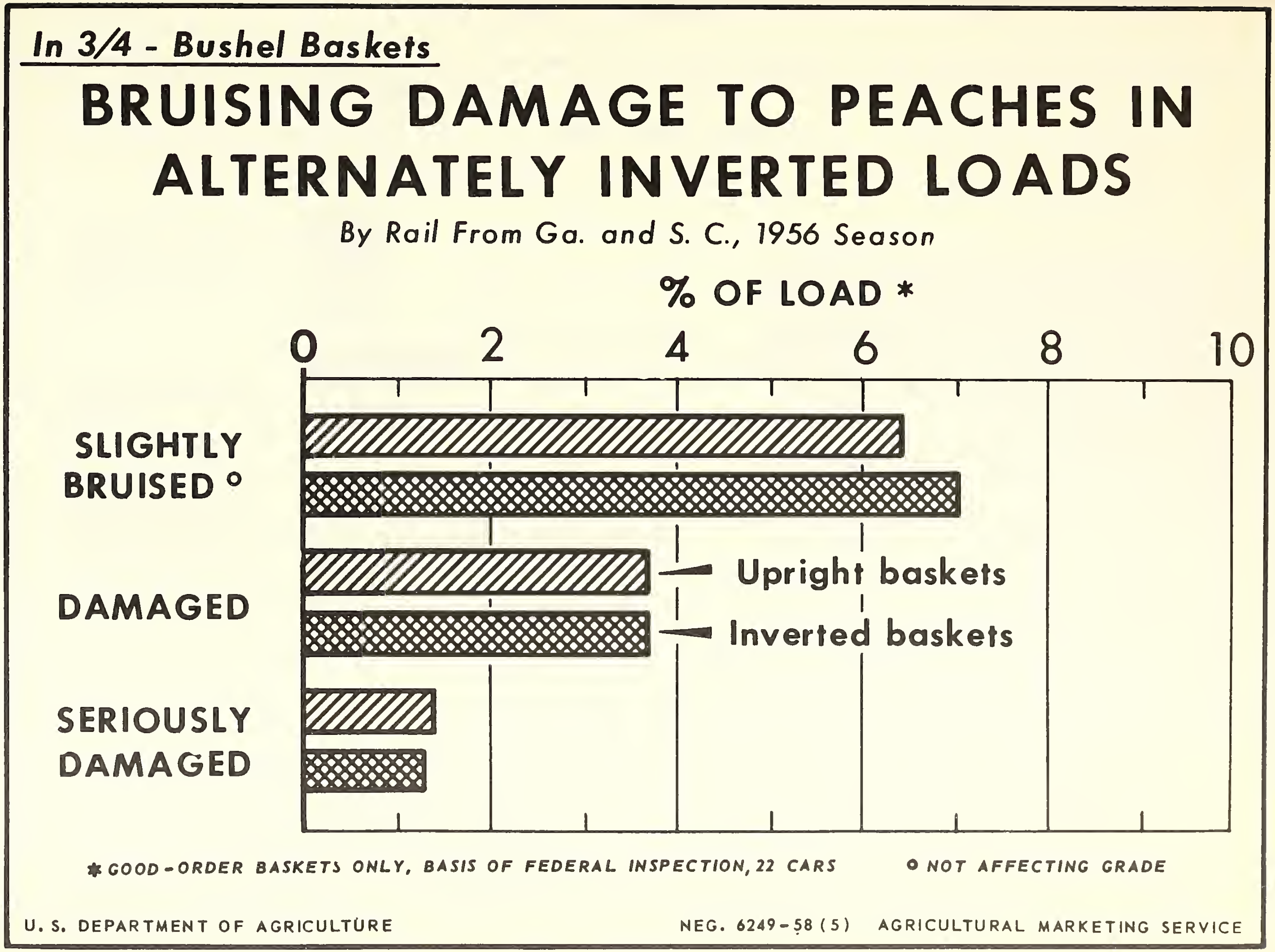
In 3/4 - Bushel Baskets
BRUISING DAMAGE TO PEACHES IN ALTERNATELY INVERTED LOADS
By Rail From Ga. and S. C., 1956 Season
% OF LOAD *
0
2
4
6
8
10
SLIGHTLY BRUISED °
DAMAGED
SERIOUSLY DAMAGED
Upright baskets
Inverted baskets
* GOOD-ORDER BASKETS ONLY, BASIS OF FEDERAL INSPECTION, 22 CARS
° NOT AFFECTING GRADE
U. S. DEPARTMENT OF AGRICULTURE
NEG. 6249-58 (5)
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Figure 23

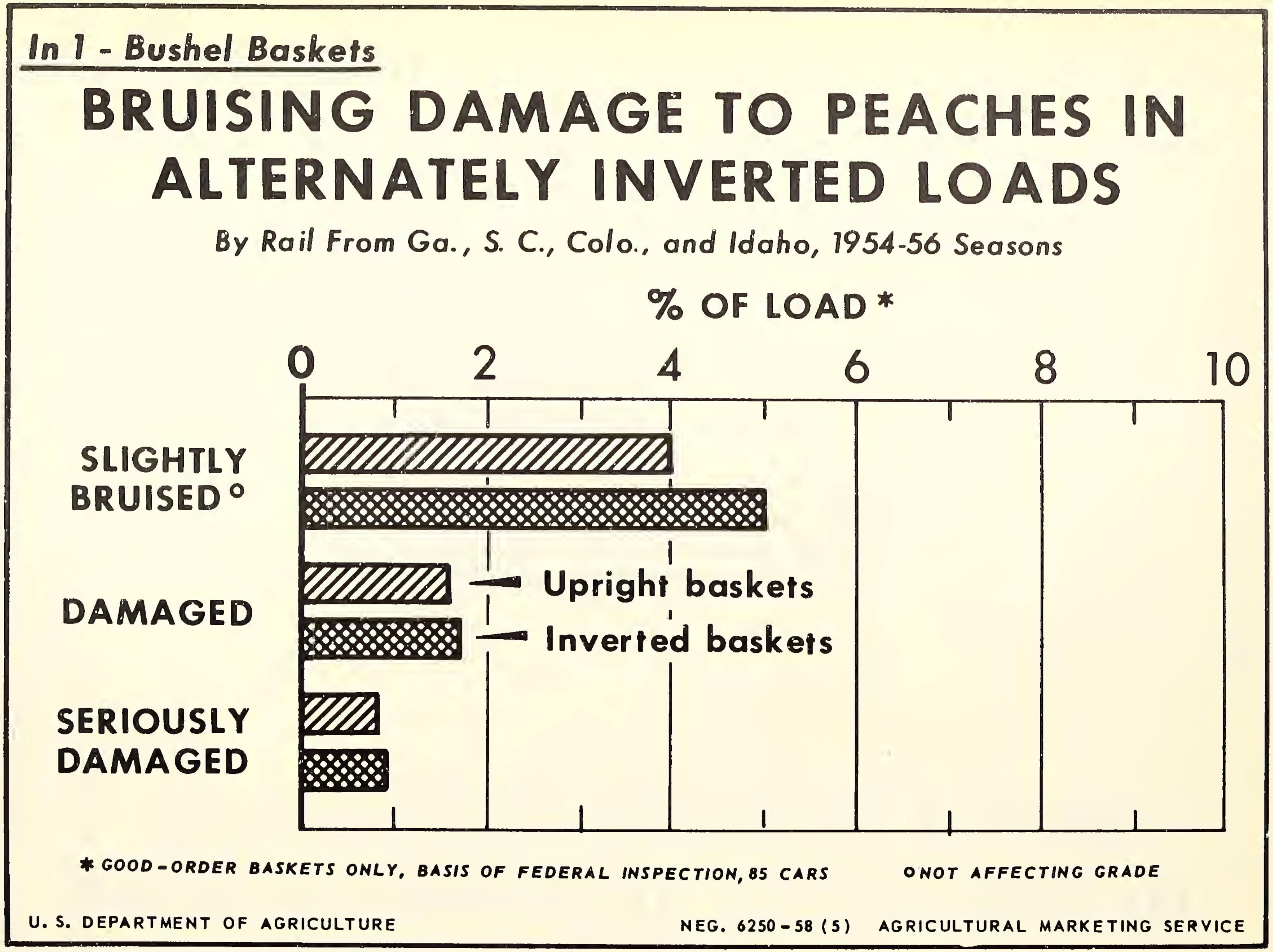
In 1 - Bushel Baskets
BRUISING DAMAGE TO PEACHES IN ALTERNATELY INVERTED LOADS
By Rail From Ga., S. C., Colo., and Idaho, 1954-56 Seasons
% OF LOAD *
0
2
4
6
8
10
SLIGHTLY BRUISED °
DAMAGED
SERIOUSLY DAMAGED
Upright baskets
Inverted baskets
* GOOD-ORDER BASKETS ONLY, BASIS OF FEDERAL INSPECTION, 85 CARS
° NOT AFFECTING GRADE
U. S. DEPARTMENT OF AGRICULTURE
NEG. 6250-58 (5)
AGRICULTURAL MARKETING SERVICE

Figure 24

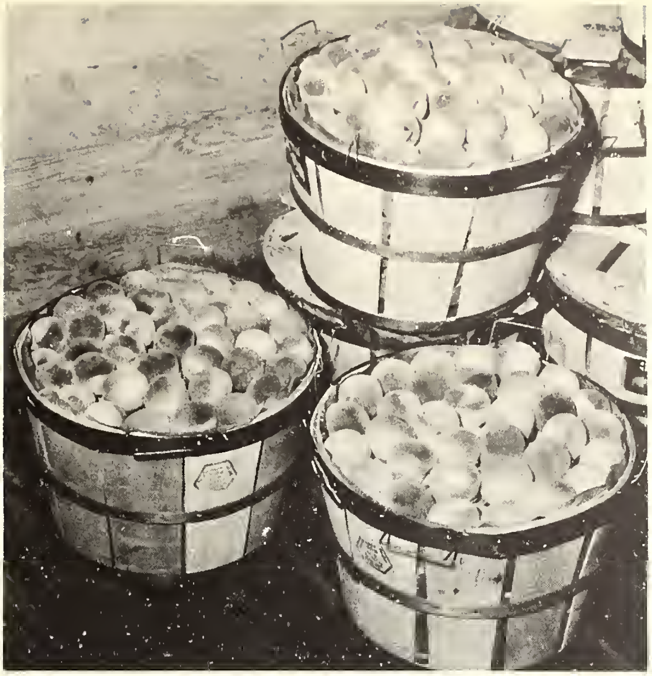

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Figure 25.--Faces of packs of peaches in upright and inverted bushel baskets from bottom layer of load at destination market, showing absence of any significant difference in fruit bruising between the two baskets on the car floor. The basket on the left was loaded upright while the one beside it on the right was inverted. The third open basket (above) also was inverted.

The packing-shed operation is designed primarily for packing peaches. After filling and lidding, the baskets are moved to the loading platform by a chain conveyor. Different sizes and grades of peaches are packed out at the same time, and several cars are usually loaded simultaneously "to order" as to size and grade. Most of the cars contain only one size and grade of fruit for marketing purposes. The packing of different sizes and grades at the same time made it necessary to have loaders performing loading in each of the cars to which baskets were routed by conveyor. Interruption of movement developed on the packing line for several reasons such as changing lots, lack of fruit, machinery breakdown, stoppages, and more than normal culling of fruit. On the conveyor line carrying the baskets to the cars, more interruptions occurred as the sizes and grades were removed at assigned car locations, the remainder passing on down the chain conveyor to the other cars farther along the loading platform. This process was repeated with as many different sizes and grades as were being packed out at one time. All interruptions in the movement on the line resulted in considerable waiting time between basket arrivals at the car doors and placing them in the load.

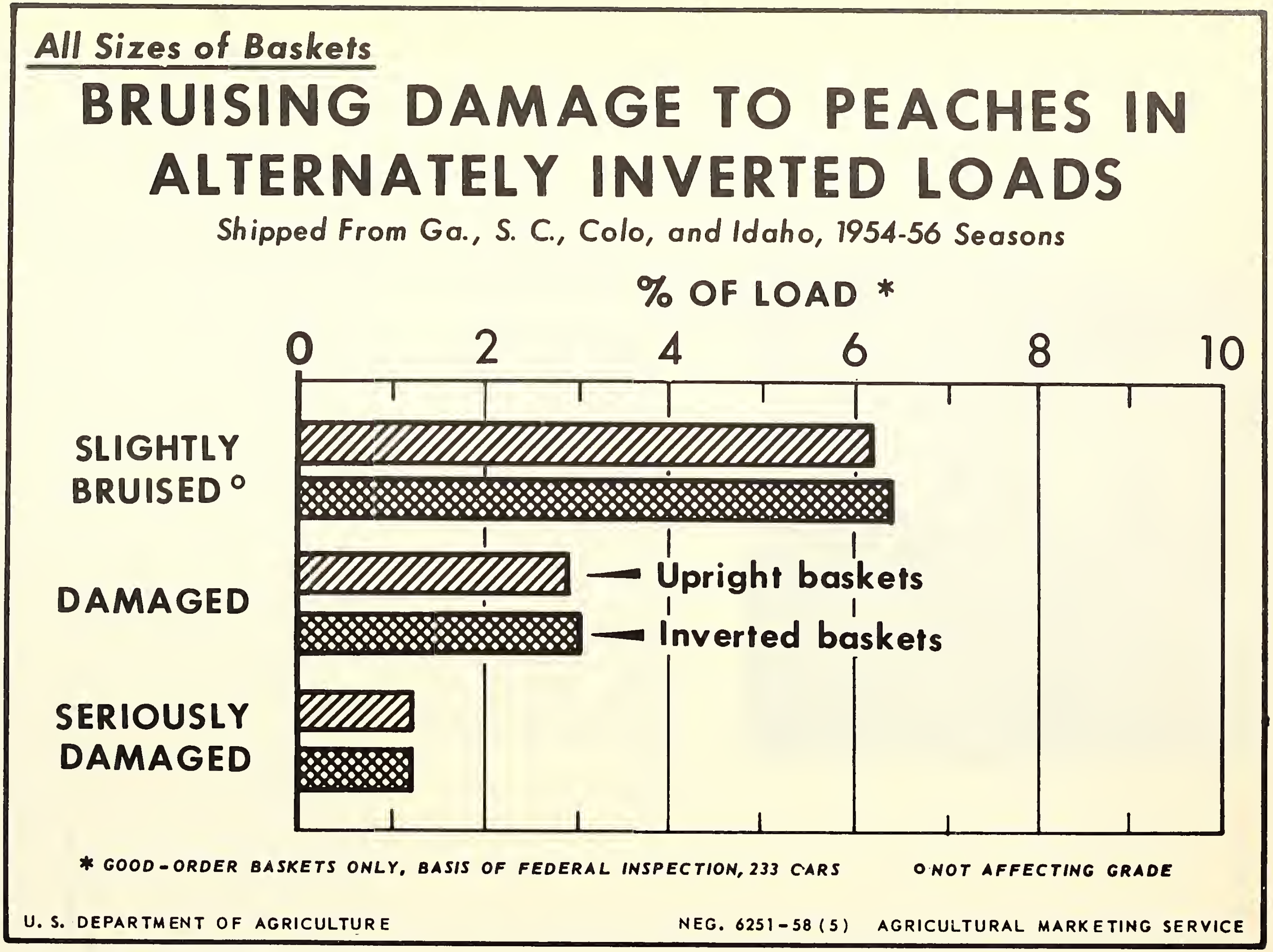
All Sizes of Baskets
BRUISING DAMAGE TO PEACHES IN ALTERNATELY INVERTED LOADS
Shipped From Ga., S. C., Colo, and Idaho, 1954-56 Seasons
% OF LOAD *
0
2
4
6
8
10
SLIGHTLY BRUISED °
DAMAGED
SERIOUSLY DAMAGED
Upright baskets
Inverted baskets
* GOOD-ORDER BASKETS ONLY, BASIS OF FEDERAL INSPECTION, 233 CARS
° NOT AFFECTING GRADE
U. S. DEPARTMENT OF AGRICULTURE
NEG. 6251-58 (5)
AGRICULTURAL MARKETING SERVICE

Figure 26

Table 19.--Comparative productive labor requirements for loading baskets of peaches, by size of container and type of load, Georgia and South Carolina, 1956 season

Size of basket and type of load	Car loader operation--productive labor for placing baskets 1/: Man-minutes per container 2/	Car loader operation--productive labor for placing baskets 1/: Man-hours per carload 2/
	Man-minutes	Man-hours
Half-bushel (Basis--800 per car)		
Standard upright load......	0.067	0.89
Alternately inverted load..	0.070	0.93
Increase...............	0.003	0.04
Three-quarter-bushel (Basis--594 per car)		
Standard upright load......	0.079	0.78
Alternately inverted load..	0.090	0.89
Increase...............	0.011	0.11
One-bushel (Basis--396 per car)		
Standard upright load......	0.111	0.73
Alternately inverted load..	0.126	0.83
Increase...............	0.015	0.10

1/ The operations of setting off baskets from the conveyor into the car and feeding them to the loaders were not timed, as the methods for the upright and inverted loads were identical. Productive labor does not include waiting time.
2/ The values include allowances for personal time and fatigue.

Table 19 shows that for the 1/2-bushel baskets there was only 0.04 man-hour of difference in productive labor per carload in favor of the standard upright load compared to the alternately inverted load. This difference is considered negligible. The alternately inverted loading method for the 3/4-bushel-basket load required 0.11 man-hour more productive labor per car, and for the 1-bushel-basket load, 0.10 man-hour more than the upright load. If the waiting time between the baskets could have been reduced, the actual time for loading a car of 3/4-bushel or 1-bushel baskets with 2-man teams would have taken approximately 3 minutes longer for the inverted method as compared

with the upright method. In the upright loads studied, a minimum of 15 minutes per carload was spent in waiting for baskets. Most of the other test carloads, including the alternately inverted loads, had considerably more waiting time per car. Thus, in actual practice, there was no difference in crew size or actual overall loading time between the two loading methods. The small increase in productive time required for the alternately inverted load was made up out of waiting time available, and the actual overall elapsed time, which included both productive time and waiting time, was almost the same for both types of loads.

Comparative Cooling Rates of Upright and Alternately Inverted Loads

Shipping tests with recording thermometers were conducted in 1955 by the U. S. Department of Agriculture on non-precooled Colorado peaches in bushel baskets. The tests covered 2 cars loaded by the upright end-to-end offset method and 10 cars loaded by the alternately inverted loading method. They were designed to ascertain the comparative rates of cooling for the 2 types of loads. Similar tests were made in the same season on 10 alternately inverted loads of non-precooled Idaho fresh prunes in 1/2-bushel baskets. The peaches were shipped in pre-iced cars with standard refrigeration, 2 percent salt being added at the first re-icing. The prunes were loaded in pre-iced cars with standard refrigeration in transit. The results of these tests are shown in figure 27, which is based on an unpublished field report. 2/

The temperature data shown in figure 27 indicate that the alternately inverted loads of peaches cooled at about the same rate as the upright end-to-end offset loads. Prunes are more difficult to cool than peaches, because the smaller fruit packs more tightly and offers greater resistance to air movement through the containers; so the tests demonstrated that the cooling rate for the alternately inverted loads of prunes in 1/2-bushel baskets would be satisfactory for peaches as well as prunes. The shipper or receiver therefore receives, for the same cost, completely adequate refrigeration of substantially more fruit through the use of the alternately inverted load instead of the standard upright load. As will be shown in a subsequent section of this report, this saving results from the shipment in the alternately inverted load of more baskets per car at a flat per-car charge for standard refrigeration, which reduces the refrigeration cost per basket of fruit.

Damage in Relation to Impact Force

Impact registers were placed in as many test cars of peaches as the supply permitted to ascertain: (1) The relationship between the degree of damage and frequency and severity of lengthwise impacts during transit; (2) the degree of damage occurring by type of load and size of basket in the upright loads and

2/ Redit, W. H., Report on Precooling and Shipping Tests of Colorado Peaches and Idaho Prunes, August, September 1955, U. S. Dept. Agr., AMS, MRD, Biological Sciences Branch (Unpublished field report).

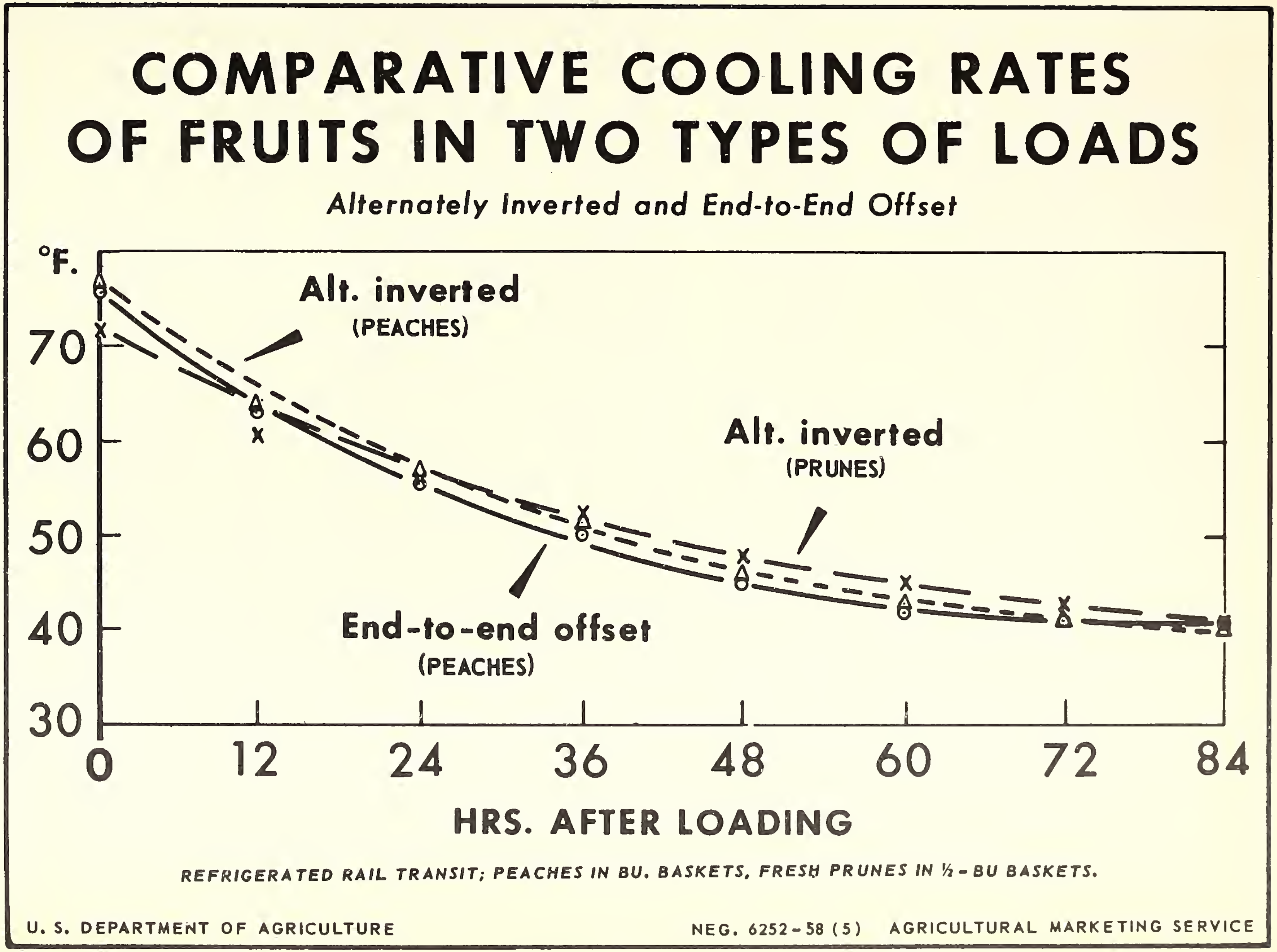
COMPARATIVE COOLING RATES
OF FRUITS IN TWO TYPES OF LOADS
Alternately Inverted and End-to-End Offset
°F.
70
60
50
40
30
Alt. inverted
(PEACHES)
Alt. inverted
(PRUNES)
End-to-end offset
(PEACHES)
0
12
24
36
48
60
72
84
HRS. AFTER LOADING
REFRIGERATED RAIL TRANSIT; PEACHES IN BU. BASKETS, FRESH PRUNES IN ½-BU BASKETS.
U. S. DEPARTMENT OF AGRICULTURE
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Figure 27

the alternately inverted loads; and (3) the locations where overspeed 3/ impacts occurred. Loss and damage prevention officials of the railroads participating in the transportation of each upright and alternately inverted load containing an impact register were furnished a copy of the impact record for the particular car or cars involved. By checking the time when the impacts took place with the train record of each car, the carrier was provided with a record of impacts that occurred on its line.

A comparison of the number and intensity of the lengthwise impacts of 5 miles per hour and over, received by the test and check shipments in which impact registers were used, is presented in table 20. There were 12 upright loads from Georgia and South Carolina in 1956, 40 alternately inverted loads from Georgia and South Carolina in 1956, and 12 alternately inverted loads from Colorado in 1955 in which impact registers recorded impacts of 5 miles per hour and over. A more detailed analysis of the impacts by speeds for the same cars appears in table 31 in the appendix.

Reference to table 20 indicates that the 12 upright loads had an average impact force index 4/ of 150.4, with averages of 4.3 impacts per car of 5 miles per hour and over and 53.8 baskets per car requiring recoopering. In contrast, the average impact force index was 211 for the 52 alternately inverted loads, with averages of 6.6 impacts per car of 5 miles per hour and over, and only 16 baskets requiring recoopering.

Although, on the average, the cars with alternately inverted loads were subjected to more severe handling, they had 37.8 fewer baskets per car damaged and requiring recoopering, a reduction of 70.2 percent compared with the upright-loaded cars. This is a further indication of the effectiveness of the alternately inverted loading method in reducing transit damage and providing safer transportation for commodities in tub-type baskets.

As is shown in table 31 in the appendix, 67.3 percent of the impacts of 5 miles per hour and over sustained by the 12 upright-loaded cars occurred in railroad yards or terminals. The same table shows that, for the 40 alternately inverted loads for which such data were available, 70.5 percent of the impacts of 5 miles per hour and over were attributable to yard and terminal handlings. These data suggest that there is need for more careful handling of cars, particularly in yards and terminals, so as to reduce effectively the amount of damage to containers and fruit in transit.

3/ Coupling (impact) speeds exceeding 4 miles per hour are generally considered by the railroads as rough handling, since the destructive force transmitted to the car body, and hence to the load, is considerably greater from impacts at speeds above this rate than below.

4/ Average Impact Force Index is the summation of the squares of the speeds of impact of 5 miles per hour or over. Findings of railroad research technicians indicate that the force of the impacts received by a load increases in approximately the same ratio as the squares of the striking speeds.

Table 20.--Comparison of number and intensity of lengthwise impacts received in transit and extent of basket breakage in test and check cars of peaches, by type of load and size of basket, from Georgia, South Carolina, and Colorado, 1955 and 1956

Type of load and size of baskets	Origin States	Year	Cars with impact registers 1/	Total impacts at speeds of 5 mph and over	Average impacts per car at speeds of 5 mph and over	Average impact speed 2/	Impact force index 3/	Total baskets in cars	Basket damage: Baskets requiring recoopering: Number of baskets damaged	Percent of total baskets	Average per car
			Number	Number	Number	MPH	Number	Number	Number	Percent	Number
Upright loads											
Half-bushel baskets........	Ga.	1956	2	9	4.5	5.2	123.5	1,607	61	3.8	30.5
Three-quarter-bushel baskets..................	S.C.	1956	9	42	4.7	5.8	166.0	5,378	565	10.5	62.8
One-bushel baskets.........	S.C.	1956	1	1	1.0	8.0	64.0	396	19	4.8	19.0
All upright loads: All sizes of baskets.......	Ga. & S. C.	1956	12	52	4.3	5.8	150.4	7,381	645	8.7	53.8
Alternately inverted loads											
Half-bushel baskets........	Ga.	1956	27	203	7.5	5.6	241.5	23,277	274	1.2	10.1
Three-quarter-bushel baskets..................	S.C.	1956	8	35	4.4	5.9	154.5	5,376	415	7.7	51.9
One-bushel baskets.........	S.C.	1956	5	37	7.4	5.3	217.4	2,065	79	3.8	15.8
	Colo.	1955	12	70	5.8	5.4	175.3	4,956	65	1.3	5.4
Combined one-bushel baskets..................	S.C. & Colo.	1955-6	17	107	6.3	5.4	187.6	7,021	144	2.1	8.5
All alternately inverted loads: All sizes of baskets.......	Ga., S. C. & Colo.	1955-6	52	345	6.6	5.6	211.0	35,674	833	2.3	16.0

1/ Including only cars with recorded impacts of 5 miles per hour and over.
2/ Weighted average.
3/ Summation of the squares of impact speeds. The destructive force transmitted to the load increases at approximately the same ratio as the squares of impact speeds.

Basket Damage in Relation to Load Shift

A study of the test cars of peaches from the Georgia-South Carolina and Colorado-Idaho areas during the 1955 and 1956 seasons was made to learn whether basket damage could be related to shifting of loads resulting from lengthwise impacts received by these cars in transit. There were 50 upright check loads and 141 alternately inverted test loads on which load-shift and basket-damage data were obtained. From the test records of these cars, it was possible to correlate the percentages of damaged baskets requiring recoopering with the extent of the load shifts. The results of this comparison are presented in figure 28.

The curves plotted in figure 28 indicate the degree of relationship between the percentages of baskets requiring recoopering and the maximum load shifts in inches, determined by a correlation analysis of the available basic data. 5/ These curves indicate that there were higher rates of basket recoopering in the upright loads than in the alternately inverted loads for load shifts up to approximately 45 inches. Beyond this point, the curves representing the percentages of baskets requiring recoopering tend to merge, indicating that for very heavy load shifts the amount of basket damage is approximately the same irrespective of the loading method. However, it is apparent that the alternately inverted loading method does contribute importantly toward the prevention of basket damage.

Most of the load shifts in connection with the cars covered by figure 28 were 30 inches or less, 82 percent of the upright loads and 96.5 percent of the alternately inverted loads being in this range. In the previous section of this report, it was developed that the impact register tests showed that the alternately inverted loads as a group received more lengthwise impacts of a comparatively high intensity than the standard upright loads. The fact that, notwithstanding the more severe handling in transit, a greater percentage of the alternately inverted loads fell in the lower range of load shift than of the standard upright loads indicates that the comparatively compact alternately inverted loads are somewhat more resistant to load shifting than the standard upright loads (fig. 29).

In constructing the curves in figures 28, observations involving zero values were omitted. For example, there were a number of instances of cars with baskets requiring recoopering where no load shift was reported. Such damage might have resulted from handling, packing, and loading of the baskets at origin; or from instances where the load, during transit, had a shift from

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5/ Using the logarithmic equation Log y = a +(log b)x, curves were fitted to the data for the upright and alternately inverted loads. The antilogarithms of computed values were plotted for both curves. Upright loads: Equation of curve, Log Ye = .2166+ .0242(x)-corrected error of estimate = 9.4 percent. Coefficient or index of correlation, P = .7049. Alternately inverted loads: Equation of curve, Log Ye = -.2601 + .0338(x)-corrected standard error of estimate = 6.12 percent. Coefficient or index of correlation, P = .27.

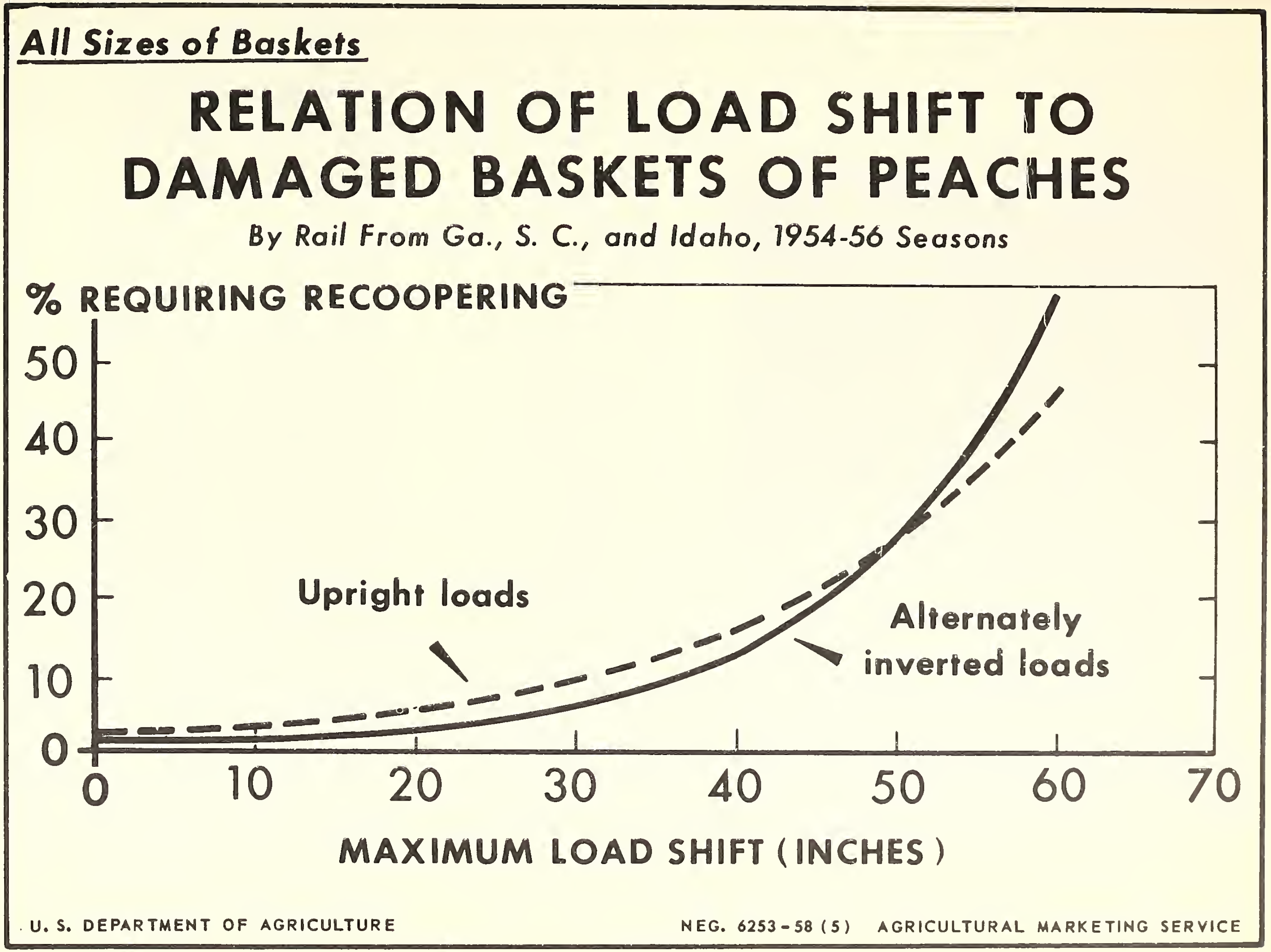
All Sizes of Baskets
RELATION OF LOAD SHIFT TO DAMAGED BASKETS OF PEACHES
By Rail From Ga., S. C., and Idaho, 1954-56 Seasons
% REQUIRING RECOOPERING
50
40
30
20
10
0
Upright loads
Alternately inverted loads
0
10
20
30
40
50
60
70
MAXIMUM LOAD SHIFT (INCHES)
U. S. DEPARTMENT OF AGRICULTURE
NEG. 6253-58 (5) AGRICULTURAL MARKETING SERVICE

Figure 28

BN-6070

Figure 29.--Top view of an end-to-end offset load of 3/4-bushel baskets of peaches at end of car, showing 15- to 25-inch shift in load. This shift resulted from several heavy lengthwise impacts and the comparatively great compressibility of the flexible baskets when loaded in the standard upright pattern.

one bulkhead and a counter shift from the other, thus returning the load to its original position; or even from vertical bounce of the load. On the other hand, some cars had no basket damage when load shifts were known to have occurred. To some extent, this may have been because consignees were inclined to exercise a degree of tolerance and accept damaged baskets where the damage was of a minor nature not requiring outright rejection.

As the curves in figure 28 were computed on positive values only and as the underlying data involve some variable causes for damage other than those directly attributable to transportation, these curves are useful only for comparative purposes and cannot be accepted as a basis for estimating the incidence of damage in relation to the extent of load shifting.

Potential Savings in Transportation Costs

The use of the alternately inverted loading method instead of the upright end-to-end offset and crosswise offset loading methods not only provides safer transportation for the commodities involved, but also affords shippers and receivers appreciable savings in per-package refrigeration costs, because more baskets can be loaded into each car. Costs shown in table 21, which are based on the more detailed data presented in table 32 in the appendix, show the potential savings on shipments of peaches and prunes from and to representative origins and destinations of test shipments. The potential savings on shipments of prunes are shown in table 21 for 1/2-bushel baskets, as this is the only size of basket used for that commodity.

Table 21 shows, for example, that the standard refrigeration charge on a carload of peaches from Fort Valley, Ga., to Providence, R. I., is $108.74, or 13.59 cents per basket on a car of 800 half-bushel baskets loaded by the end-to-end offset method, or 12.53 cents per basket on a car of 868 half-bushel baskets loaded by the alternately inverted method. This difference produces a saving of 1.06 cents per basket, or a total of $9.20 in favor of the 868-basket alternately inverted load.

The railroads, too, benefit costwise from use of the alternately inverted loading method, through savings in direct transportation costs resulting from the heavier loading per car. This is demonstrated by the data in table 22, which is based on a study of rail transportation cost by territories as of January 1, 1956, made by the Bureau of Accounts, Cost Finding and Valuation, of the Interstate Commerce Commission. This table presents the potential savings that might have been realized by the railroads in out-of-pocket transportation costs if all the carload peach shipments from the Georgia-South Carolina area to Official Territory in 1956 loaded by the upright end-to-end offset and crosswise offset loading method had been transported in cars loaded by the alternately inverted loading method.

Table 22 shows that the total upright loaded shipments of peaches from the Georgia-South Carolina area to Official Territory in 1956 amounted to 1,862 cars and consisted of 658 cars of 1/2-bushel baskets and 891 cars of 1-bushel baskets loaded by the end-to-end offset method, and 313 cars of 3/4-bushel baskets loaded by the crosswise offset method. They could have been transported in 1,737 cars loaded by the alternately inverted method, with a reduction of 125 cars and a total saving of $32,336. In addition, the alternately inverted loading would have resulted in (a) more efficient use of refrigerator cars, which is an advantage to the railroads and shippers during seasons when such equipment is in short supply; and (b) reduced "return empty" car mileage in proportion to the tonnage transported, as fewer cars would have been required to move the equivalent volume.

Table 21.--Potential savings to shippers and receivers in carload refrigeration costs from use of alternately inverted loads instead of upright end-to-end offset and crosswise offset loads for equivalent carloads of fresh peaches and prunes by rail, 1956

From	To	Type of load	Baskets per car	Standard refrigeration charges: Per car 1/	Standard refrigeration charges: Per basket	Savings from use of alternately inverted load: Per basket	Savings from use of alternately inverted load: Total
			Number	Dollars	Cents	Cents	Dollars
			Peaches in 1/2-bushel baskets				
Fort Valley, Ga.	Providence, R. I.	End-to-end offset	800	108.74	13.59	-	-
		Alternately inverted	868	108.74	12.53	1.06	9.20
Fort Valley, Ga.	Cleveland, Ohio	End-to-end offset	800	101.14	12.64	-	-
		Alternately inverted	868	101.14	11.65	0.99	8.59
Johnston, S. C.	Pittsburgh, Pa.	End-to-end offset	800	92.77	11.60	-	-
		Alternately inverted	868	92.77	10.69	0.91	7.90
			Peaches in 3/4-bushel baskets				
Gramling, S. C.	Chicago, Ill.	Crosswise offset	594	110.27	18.56	-	-
		Alternately inverted	672	110.27	16.41	2.15	14.44
Inman, S. C.	Boston, Mass.	Crosswise offset	594	101.14	17.03	-	-
		Alternately inverted	672	101.14	15.05	1.98	13.31
Gramling, S. C.	Cincinnati, Ohio	Crosswise offset	594	96.58	16.26	-	-
		Alternately inverted	672	96.58	14.37	1.89	12.70
			Peaches in bushel baskets				
Spartanburg, S. C.	Cleveland, Ohio	End-to-end offset	396	107.99	27.27	-	-
		Alternately inverted	413	107.99	26.15	1.12	4.63
Johnston, S. C.	New Haven, Conn.	End-to-end offset	396	101.14	25.54	-	-
		Alternately inverted	413	101.14	24.49	1.05	4.34
Palisade, Colo.	Wichita, Kans.	End-to-end offset	396	87.46	22.09	-	-
		Alternately inverted	413	87.46	21.18	.91	3.76
			Prunes in 1/2-bushel baskets				
Emmett, Idaho	Boston, Mass.	End-to-end offset	364	133.08	15.40	-	-
		Alternately inverted	896	133.03	14.85	0.55	4.93
Emmett, Idaho	Houston, Texas	End-to-end offset	864	114.07	13.20	-	-
		Alternately inverted	896	114.07	12.73	0.47	4.21
Homedale, Idaho	Kansas City, Mo.	End-to-end offset	864	98.85	11.44	-	-
		Alternately inverted	896	98.85	11.03	0.41	3.67

1/ Perishable Protective Tariff No. 16, ICC No. 31, issued by W. T. Jamison, Agent, National Perishable Freight Committee, Chicago, Ill.

Table 22.--Average out-of-pocket railroad costs and savings from transporting peaches in refrigerator cars from Georgia-South Carolina area to Official Territory 1/ in alternately inverted loads instead of upright end-to-end offset and crosswise offset loads, by size of basket and type of load, 1956

Type of load	Basket size	Baskets per carload	Weight per carload 2/	Cars shipped 1956 3/	Cars required by A.I. load 4/	Average rail haul 5/	Out-of-pocket costs 6/: Per 100 lbs.	Out-of-pocket costs 6/: Per carload	Net savings from alternately inverted loading: Per 100 lbs.	Net savings from alternately inverted loading: Per carload	Net savings from alternately inverted loading: Total
		Number	Pounds	Number	Number	Miles	Dollars	Dollars	Dollars	Dollars	Dollars
End-to-end offset......	1/2-bu.	800	22,400	658	-	872	1.26	282.24	-	-	-
Alternately inverted...	1/2-bu.	868	24,304	-	606	872	1.17	284.36	0.09	21.37	13,253.22
Crosswise offset.......	3/4-bu.	594	24,948	313	-	872	1.14	284.41	-	-	-
Alternately inverted...	3/4-bu.	672	28,224	-	277	872	1.02	287.88	0.12	33.37	9,381.99
End-to-end offset......	1-bu.	396	21,730	891	-	872	1.29	280.95	-	-	-
Alternately inverted...	1-bu.	413	22,715	-	854	872	1.24	281.66	0.05	11.35	9,701.44
Totals..........				1,862	1,737					7/ 18.61	32,336.65

1/ Official Territory is generally north of the Ohio and Potomac Rivers and east of the Mississippi River.

2/ Based on shipping weights per basket of 28 pounds for 1/2-bushels, 42 pounds for 3/4-bushels, and 55 pounds for 1-bushels.

3/ Based on total shipments from Georgia and South Carolina as shown in Fresh Fruit and Vegetable Shipments by Commodities, States, and Months, Calendar Year 1956, U. S. Dept. Agr. AMS, Fruit and Vegetable Division, Market News Branch, with number of 1/2-, 3/4-, and 1-bushel baskets, by type of load, determined on ratio of these sizes of baskets according to type of load as per statistics of peach car unloads in Railroad Perishable Inspection Agency territory, compiled by that Agency.

4/ The number of cars loaded by the alternately inverted loading method required to haul the same volume of the commodity as in the other types of loads with which the alternately inverted load is compared.

5/ Carload Waybill Statistics, 1954, State-to-State Distribution of Products of Agriculture Traffic and Revenue, Statement SS-2, ICC, Bureau of Transport Economics and Statistics, Washington, D. C., November, 1955. The 1954 data were used, as there were no peach shipments from Georgia and South Carolina to Official Territory in 1955 due to freezing damage to crop, and 1956 ICC data were not available at time this tabulation was prepared. Weighted average short-line distances of carload peach shipments from Georgia and South Carolina to Official Territory in Carload Waybill Statistics, 1954 were used in obtaining the average short-line rail haul of 772 miles which was increased 13 percent to 872 miles to allow for average circuity as determined by ICC. The average short-line rail haul from Johnston, S. C., and Fort Valley, Ga., representative peach shipping points, to the Southern Territory gateways of Potomac Yards, Va., Cincinnati, Ohio, Louisville, Ky., and Evansville, Ind., is 601 miles which, increased 13 percent for average circuity, is 679 miles. Thus, out of the average rail haul of 872 miles from Georgia and South Carolina to Official Territory, 679 miles is in Southern Territory and 193 miles in Official Territory.

6/ Rail Carload Cost Scales by Territories as of January 1, 1956, Statement No. 5-56, ICC, Bureau of Accounts, Cost Finding and Valuation, May, 1956. Average out-of-pocket costs of through freight trains in each territory plus half of terminal expense in each territory were calculated from table 3. Out-of-pocket expenses are direct expenses incurred in handling a shipment or expenses which would be avoided if shipments were not handled. Costs include allowances for a return to management and for an average 13 percent circuity of haul in each territory, but not for loss and damage claim payments.

7/ Weighted average for all alternately inverted carloads of all basket sizes.

CONCLUSIONS

Shipping tests by rail in 1954, 1955, and 1956 demonstrated that the alternately inverted loading method for peaches and prunes in tub-type baskets in railroad refrigerator cars reduces materially the excessive basket damage encountered with the standard upright loading methods. For example, taking the 1/2-, 3/4-, and 1-bushel-basket loads combined, reductions in container damage resulting from the alternately inverted loading of test cars, compared with the upright loaded check cars, were 64.9 percent, or 29 baskets per car, requiring recoopering, and 58.6 percent, or 14.6 baskets per car, in bad-order. These tests also established that bruising of the fruit and cooling rates for alternately inverted loads in transit are approximately the same as for cars loaded by the standard upright methods.

The alternately inverted load, because of its greater compactness, affords shippers and receivers some savings in the cost of railroad refrigeration as compared with the upright loading methods. An alternately inverted load of 672 three-quarter-bushel baskets of peaches, shipped from Gramling, S. C., to Chicago, Ill., for example, affords a saving in refrigeration costs of 2.15 cents per basket, or $14.44, as compared with an equivalent upright crosswise offset load of 594 similar baskets.

The heavier loading of refrigerator cars with the alternately inverted load also produces economies for the railroads. The 1,862 upright loads of peaches in all sizes of baskets shipped from Georgia and South Carolina to various markets in Official Territory in 1956 could have been transported in 1,737 cars loaded by the alternately inverted loading method, with a reduction of 125 cars, at savings in railroad out-of-pocket costs of $32,336.

APPENDIX

Detailed Basket Arrangements by Type of Loading Method

End-to-end Offset Load.--In loading a typical car of 800 half-bushel baskets of peaches in 8 parallel rows lengthwise of the car, each row having 4 layers of 25 baskets, the first lengthwise row along the side wall of the car is started with the first basket of the first, or floor, layer being placed upright on the car floor in tight contact with one side wall and one bunker wall at the car end. Successive baskets of this first layer of this one side wall row of 25 are lined up tightly against each other and against the side wall. At the opposite end of the car there will be space remaining between the last basket of the first layer and the bunker wall, equal to about half of the top diameter of a basket. The second layer of 25 baskets is begun at this end of the car, the first basket of the layer being placed tightly against the bunker wall, with half the basket resting on the basket beneath and half overhanging the space below between the last basket in the first layer and the bunker bulkhead. The second layer is completed by loading successive baskets tightly against the car side wall, resting equally on the 2 baskets underneath, but separated from the bunker wall at the car end from which the first layer was started by a distance equal to about half of the top diameter of a basket. The third and fourth layers are loaded exactly as the first and second layers, respectively.

The second lengthwise row of 4 layers is commenced on the car floor at the same end of the car from which the first lengthwise row was started. The first basket of the first, or floor, layer of the second lengthwise row is set on the floor away from the bunker wall at the car end by a space equal to half of the top diameter of a basket. The top rim of the basket adjacent to the first row will then nest tightly into the recess between 2 adjacent baskets in that row. Successive baskets of the first layer of the second lengthwise row are loaded tightly against each other, in tight contact with each pair of baskets in the adjoining first row floor layer, with the last basket in tight contact with the bunker wall at the car end. The first basket of the second layer of the second lengthwise row rests equally on the last 2 baskets of the first layer, and it is separated from the bunker wall at the end of the car opposite that from which the row was started by about half of the top diameter of a basket. The remaining baskets of the second layer rest equally on the 2 baskets beneath, except that the last basket in the row is in tight contact with the bunker wall at the car end and rests partly on the first basket of the first layer and partly overhangs the space between that basket and the bunker wall. The third and fourth layers are loaded the same as the first and second layers, respectively.

The first 2 lengthwise rows, previously described, set the patterns for the remaining 6 lengthwise rows. Thus the third, fifth, and seventh rows are loaded in the same manner as the first; and the fourth, sixth, and eighth exactly the same as the second, except that the seventh and eighth rows are

loaded together, working from both ends of the car. The end-to-end offset pattern can be accomplished also by using the first lengthwise row as a guide row and loading the baskets diagonally across the car from the guide row to the opposite side wall.

The typical check cars of fresh prunes in 1/2-bushel baskets and peaches in 1-bushel baskets loaded by the end-to-end offset method contained 864 1/2-bushel baskets or 396 1-bushel baskets. The loading pattern for the 864 1/2-bushel baskets was 8 parallel rows lengthwise of the car, each lengthwise row having 4 layers of 27 baskets each; that for the 396 1-bushel baskets contained 6 parallel rows lengthwise of the car, each lengthwise row having 3 layers of 22 baskets each.

The reason for the differences between the number of baskets in the loads of peaches in 1/2-bushel baskets in the Southeast and those used for fresh prunes in Idaho is the slight difference in size of the baskets used in the two areas. The 1/2-bushel baskets used in the Southeast have an average top diameter of $14\frac{1}{2}$ inches, while those generally used in areas west of the Mississippi River have a top diameter of 14 inches.

Crosswise Offset Load.--A crosswise offset load of 594 three-quarter-bushel baskets of peaches contains 27 stacks crosswise of the car, each stack having 22 baskets in 4 layers; that is, 2 alternate layers of 6 baskets each and 2 alternate layers of 5 baskets each. In loading such a car, the first crosswise stack in each end of the car is begun by placing a first layer of 6 baskets across the car on the floor from 1 side wall to the other in tight contact with each other and with the bunker wall at the car end. The second layer of this stack consists of 5 baskets, centered on top of the baskets in the first layer, but in tight contact with the bunker wall at the car end. Each basket then rests equally on 2 baskets beneath, so that the 2 end baskets of the layer are separated from the side walls of the car by a space equal to about half of the top diameter of a basket. The third and fourth layers are built the same as the respective first and second layers, the third having 6 baskets and the fourth, 5 baskets.

The second crosswise stack of 3/4-bushel baskets in each end of the car has a first layer of 5 baskets centered on the car floor, one basket placed between and in tight contact with each pair of baskets in the preceding crosswise stacks, so that the 2 end baskets of the layer are separated from the side walls of the car by a space equal to about half of the top diameter of a basket. The second layer of the second crosswise stack consists of 6 baskets across the car from side wall to side wall in close contact with each other and with those in the first crosswise stack, each basket resting equally on 2 baskets below, except that the 2 baskets on the ends of the layer are placed against the car side walls, with half of each basket overhanging the space beneath and the other half of each basket resting on the end baskets of the first layer. The third layer is constructed the same as the first, with 5 baskets, and the fourth the same as the second, with 6 baskets.

The third, fifth, seventh, etc., crosswise stacks of the 3/4-bushel load are patterned identically after the first crosswise stack, and the fourth, sixth, eighth, etc., crosswise stacks are made the same as the second crosswise stack. The baskets in the doorway area of the car are arranged so that no slack, or unoccupied space, will be left between the two ends of the load.

The 1/2-bushel crosswise offset test cars of peaches generally contained 806 baskets. The crosswise offset loading pattern works out similarly to that used for the 3/4-bushel baskets, except that there are 31 stacks in the car, each stack having 26 baskets in 4 layers; that is, 2 alternate layers with 7 baskets each across the car from side wall to side wall and 2 alternate layers of 6 baskets each across the car, but separated from each side wall to a distance equal to about half of the top diameter of a basket.

Alternately Inverted Load.—An alternately inverted load of 868 half-bushel baskets of peaches comprises 31 stacks crosswise of the car, each stack having 4 layers of 7 baskets each. The first crosswise stack of the 1/2-bushel baskets in each end of the car has a first, or floor, layer of 7 baskets in which the first basket is set upright in the corner of the car, fitting tightly against the side wall and against the bunker wall at the car end. Successive baskets of the layer are fitted tightly against the first and each other basket in the line and against the bunker wall. The third, fifth, and seventh baskets are loaded upright and the remaining 3 inverted. At the opposite side wall of the car, the seventh, or last, basket of the layer is separated from that wall by a space equal to about half of the top diameter of a basket. The second layer of 7 baskets is begun over the end of the first layer. The first basket of the second layer is inverted and placed tightly against the car side wall and the bunker wall, with half of it overhanging the space below and the remaining half resting on the last basket of the first layer beneath. The second layer is completed by additional baskets stowed tightly against the first basket and each other and against the bunker wall, and resting equally on the 2 baskets beneath. The third, fifth, and seventh baskets are inverted and the 3 remaining ones are upright. The seventh, or last basket of the layer is separated from the opposite side wall of the car by a distance equal to half the top diameter of a basket. The third and fourth layers of the first crosswise stack, each containing 7 baskets, are loaded in the same way as the first and second layers, respectively.

The second crosswise stack of 1/2-bushels in each end of the car is started with a first, or floor, layer from the side wall of the car opposite to the side wall from which the first crosswise stack was begun. The first basket of this first, or floor, layer of 7 baskets is inverted and loaded tightly against the car side wall and against the last basket of the first layer of the first crosswise stack. Succeeding baskets of the first layer of the second crosswise stack are loaded tightly against the first basket and each other and in tight contact with, and nesting tightly into, the recesses between each pair of baskets in the first crosswise stack. The third, fifth, and seventh baskets are inverted, and the remaining 3 upright. At the opposite side wall of the car, the seventh, or last basket, is separated from that side wall by a space

equal to about half the top diameter of a basket. The second layer of 7 baskets in the second crosswise stack is commenced over the end of the first layer. The first basket of this second layer is loaded upright tightly against the car side wall and against the basket in the first stack, with half of the basket resting on the last basket of the first layer beneath and partly overhanging the space below. Additional baskets of the second layer are loaded tightly against the first basket and each other, and in tight contact with each pair of baskets in the adjoining crosswise stack; the third, fifth, and seventh baskets being upright and the remaining 3 inverted. The seventh, or last, basket is separated from the opposite side wall of the car by about half the top diameter of a basket. The third and fourth layers of 7 baskets each are constructed the same as the first and second layers, respectively.

The third, fifth, and all odd-numbered stacks of the alternately inverted 1/2-bushel load are patterned identically after the first crosswise stack, and the fourth, sixth, and all even-numbered crosswise stacks follow the procedure used for the second crosswise stack. The two parts of the load begun in opposite ends of the car are brought together in the doorway area of the car in such a way that little or no slack remains. In the completed load, all the baskets adjacent to one side wall of the car are upright and all those next to the other side wall are inverted.

The typical alternately inverted test loads of 3/4-bushel baskets of peaches and of the 1/2-bushel baskets of fresh prunes, loaded by the same procedure as is applicable to the 1/2-bushels of peaches, consist of 672 3/4-bushel baskets of peaches and 896 half-bushel baskets of fresh prunes, respectively. The 672-basket load is made up of 28 stacks crosswise of the car, each stack having 4 layers of 6 baskets each, while the 896-basket load consists of 32 crosswise stacks, with 4 layers of 7 baskets each.

The loading of the alternately inverted test loads of peaches in 1-bushel baskets involves a somewhat different loading pattern than the alternately inverted loading of the 1/2- and 3/4-bushel test loads previously described, although alternate baskets are inverted in each layer of each crosswise stack. A typical alternately inverted test load of peaches in 1-bushel baskets totals 413 baskets, loaded in 25 stacks crosswise of the car with 3 layers per stack; that is, 13 crosswise stacks having 17 baskets each and 12 alternate crosswise stacks having 16 baskets each. Each of the 13 crosswise stacks includes a bottom and a top layer of 6 baskets per layer extending from one side wall of the car to the other, and a middle layer of 5 baskets. The 2 baskets at opposite ends of this latter layer are separated from the car side wall by a distance equal to about half of the top diameter of a basket. In each of the remaining 12 crosswise stacks, there are a bottom and a top layer with 5 baskets per layer, the 2 baskets at opposite ends of these layers being separated from the car side walls by about half of the top diameter of a basket, and a middle layer of 6 baskets extending from one side wall of the car to the other. In these alternately inverted loads of peaches in 1-bushel baskets, each basket of each layer above the first layer rests equally on each 2 baskets of the layer beneath, except that in the 6-wide layers extending from one side wall of the car to the other, the end baskets rest partly on the end baskets of the 5-basket layer beneath and overhang the space between the latter 2 baskets and the car side walls.

Table 23.--Basket damage in upright end-to-end offset and crosswise offset loads of peaches in cars unloaded in 38 markets, by size of basket, 1951, 1953, 1954, and 1956 seasons

Season and size of baskets	Cars and baskets unloaded		Baskets requiring recoopering			Baskets delivered in bad order		
	Total cars	Total baskets	Number of baskets	Percent of total baskets unloaded	Average per car	Number of baskets	Percent of total baskets unloaded	Average per car
	Number	Number	Number	Percent	Number	Number	Percent	Number
1951								
Half-bushel........	1,464	1,264,896	45,560	3.6	31.1	22,383	1.8	15.3
Three-quarter-bushel...........	-	-	-	-	-	-	-	-
One-bushel........	3,856	1,526,976	141,501	9.3	36.7	89,382	5.9	23.2
1953								
Half-bushel........	1,141	985,824	32,264	3.3	28.3	18,295	1.9	16.0
Three-quarter-bushel...........	225	133,650	5,862	4.4	26.0	3,337	2.5	14.8
One-bushel........	2,145	849,420	75,037	8.8	34.9	47,625	5.6	22.2
1954								
Half-bushel........	964	771,200	24,824	3.2	24.7	13,355	1.7	13.8
Three-quarter-bushel...........	534	317,196	16,636	5.2	31.2	9,860	3.1	18.5
One-bushel........	1,211	479,556	33,323	6.9	27.5	19,940	4.2	16.5
1956								
Half-bushel........	677	541,600	23,439	4.3	34.6	13,103	2.4	19.4
Three-quarter-bushel...........	366	217,404	12,632	5.8	34.5	7,081	3.3	19.3
One-bushel........	795	314,820	26,456	8.4	33.3	16,682	5.3	21.0
Grand totals								
Half-bushel........	4,246	3,563,520	126,087	3.5	29.7	67,136	1.9	15.8
Three-quarter-bushel...........	1,125	668,250	35,130	5.3	31.2	20,278	3.0	18.0
One-bushel........	8,007	3,170,772	276,317	8.7	34.5	173,629	5.5	21.7

Reports of Railroad Perishable Inspection Agency.

Table 24.--Basket damage in rail shipments of fresh prunes and plums in 1/2-bushel baskets in upright end-to-end offset and crosswise offset loads unloaded in 38 markets, 1951, 1952, 1953, 1955, and 1956 seasons

Season	Cars and baskets unloaded		Baskets requiring recoopering			Baskets delivered in bad order		
	Total cars	Total baskets	Number of baskets	Percent of total baskets unloaded	Average per car	Number of baskets	Percent of total baskets unloaded	Average per car
	Number	Number	Number	Percent	Number	Number	Percent	Number
1951.......	807	697,248	44,175	6.5	54.7	32,996	4.7	40.9
1952.......	1,132	978,048	51,846	5.3	45.8	36,694	3.8	32.4
1953.......	1,191	1,029,024	56,387	5.5	47.3	43,796	4.3	36.8
1955.......	1,209	1,042,848	48,974	4.7	40.5	35,275	3.4	29.2
1956.......	460	396,224	27,948	7.1	60.8	20,448	5.2	44.5
Total......	4,799	4,143,392	229,330	5.5	47.8	169,209	4.1	35.3

Reports of Railroad Perishable Inspection Agency.

Table 25.--Range of basket damage in peach shipments from Georgia and South Carolina, by size of basket and type of load, 1956

Size of baskets and type of load	Test cars	Baskets requiring recoopering: Cars with 0 - 4% damage	Baskets requiring recoopering: Cars with over 4% damage	Baskets delivered in bad order: Cars with 0 - 4% damage	Baskets delivered in bad order: Cars with over 4% damage
	Number	Percent	Percent	Percent	Percent
Half-bushel baskets					
Upright loads	17	88.2	11.8	100.0	0
Alternately inverted loads	171	92.4	7.6	95.9	4.1
Three-quarter-bushel baskets					
Upright loads	28	57.1	42.9	82.1	17.9
Alternately inverted loads	32	68.8	31.2	93.8	6.2
One-bushel baskets					
Upright loads	23	26.1	73.9	43.5	56.5
Alternately inverted loads	107	60.7	39.3	69.1	30.9
All sizes of baskets					
Upright loads	68	54.4	45.6	73.5	26.5
Alternately inverted loads	310	79.0	21.1	86.5	13.5

Table 26.--Comparative bruising damage in rail shipments of peaches in 1/2-bushel baskets from Georgia and South Carolina, by type of load, 1954 and 1956

Type of load, shipping area, and basis of comparison	Season	Test cars	Total baskets	Fruit bruising 1/		
				Slight bruising 2/	Damage by bruising	Serious bruising
		Number	Number	Percent	Percent	Percent
Upright end-to-end offset loads						
Georgia and South Carolina	1956	15	12,220	5.1	2.5	0.6
Average per car			815			
Alternately inverted loads						
Georgia and South Carolina	1954	4	3,470	2.7	2.1	0.9
Average per car			868			
Upright baskets			1,735	3.2	2.1	1.0
Inverted baskets			1,735	2.1	2.1	0.8
Georgia and South Carolina	1956	122	105,845	7.1	3.3	1.3
Average per car			868			
Upright baskets			52,896	7.0	3.3	1.3
Inverted baskets			52,949	7.1	3.2	1.3
All alternately inverted loads	1954 and 1956	126	109,315	6.9	3.3	1.3
Average per car			868			
Upright baskets			54,631	6.9	3.3	1.3
Inverted baskets			54,684	6.9	3.2	1.3

1/ Good-order baskets only. Basis of Federal inspection.
2/ Not affecting grade.

Table 27.--Comparative bruising damage in rail shipments of peaches in 3/4-bushel baskets from Georgia and South Carolina, by type of load, 1956

Type of load, shipping area, and basis of comparison	Test cars	Total baskets	Fruit bruising 1/		
			Slight bruising 2/	Damage by bruising	Serious bruising
	Number	Number	Percent	Percent	Percent
Upright crosswise offset loads					
Georgia and South Carolina	28	17,302	7.0	3.2	1.8
Average per car		618			
Alternately inverted loads					
Georgia and South Carolina	22	14,792	6.7	3.7	1.4
Average per car		672			
Upright baskets		7,396	6.4	3.7	1.4
Inverted baskets		7,396	7.0	3.7	1.3

1/ Good-order baskets only. Basis of Federal inspection.
2/ Not affecting grade.

Table 28.--Comparative bruising damage in rail shipments of peaches in 1-bushel baskets from Georgia, South Carolina, Colorado, and Idaho, by type of load, 1954, 1955, 1956

Type of load, shipping area, and basis of comparison	Season	Test cars	Total baskets	Fruit bruising 1/ Slight bruising 2/	Damage by bruising	Serious bruising
		Number	Number	Percent	Percent	Percent
Upright end-to-end offset loads						
Georgia and South Carolina	1956	12	4,752	4.8	2.0	1.1
Average per car			396			
Alternately inverted loads						
Georgia and South Carolina	1954	4	1,664	3.0	2.4	0.7
Average per car			416			
Upright baskets			906	1.7	2.1	0.4
Inverted baskets			758	3.3	2.7	1.1
Colorado and Idaho	1955	8	3,304	4.2	2.4	0
Average per car			413			
Upright baskets			1,800	4.8	2.6	0
Inverted baskets			1,504	3.5	2.1	0
Georgia and South Carolina	1956	66	27,274	4.0	1.3	0.6
Average per car			413			
Upright baskets			14,858	3.7	1.3	0.5
Inverted baskets			12,416	4.4	1.4	0.7
Colorado	1956	7	2,891	7.1	3.0	4.6
Average per car			413			
Upright baskets			1,575	6.9	3.0	4.9
Inverted baskets			1,316	7.3	3.1	4.2
All alternately inverted loads						
Total	1954-56	85	35,133	4.2	1.6	0.9
Average per car			413			
Upright baskets			19,139	4.0	1.6	0.8
Inverted baskets			15,994	4.5	1.7	0.9

1/ Good-order baskets only. Basis of Federal inspection.
2/ Not affecting grade.

Table 29.--Comparative bruising damage in rail shipments of peaches in all sizes of baskets from Georgia, South Carolina, Colorado, and Idaho, by type of load, 1954, 1955, 1956

Type of load, shipping area, and basis of comparison	Season	Test cars	Total baskets	Fruit bruising 1/: Slight bruising 2/	Fruit bruising 1/: Damage by bruising	Fruit bruising 1/: Serious bruising
		Number	Number	Percent	Percent	Percent
All standard upright loads						
Georgia and South Carolina	1956	55	34,274	6.0	2.8	1.3
All alternately inverted loads						
Georgia, South Carolina, Colorado, and Idaho	1954-56	233	159,240	6.3	3.0	1.2
Upright baskets			81,166	6.2	2.9	1.2
Inverted baskets			78,074	6.4	3.0	1.2

1/ Good-order baskets only. Basis of Federal inspection.
2/ Not affecting grade.

Table 30.--Comparative bruising damage in rail shipments of fresh prunes from Idaho in 1/2-bushel baskets, by type of load, 1955 season

Type of load and basis of comparison	Number of cars	Total baskets	Fruit bruising 1/: Slight bruising 2/	Fruit bruising 1/: Damage by bruising	Fruit bruising 1/: Serious bruising
	Number	Number	Percent	Percent	Percent
Upright end-to-end offset loads	4	3,456	6.3	0.8	0.2
Alternately inverted loads	16	14,336	6.8	1.3	0.1
Upright baskets		7,168	5.1	1.1	Less 0.1
Inverted baskets		7,168	8.6	1.4	0.1

1/ Good-order baskets only. Basis of Federal inspection.
2/ Not affecting grade.

Table 31.--Comparison of impacts 5 miles per hour and over received by rail shipments of peaches, by type of load and size of baskets, 1955 and 1956 seasons

Type of load, size of basket, shipping area	Year	Cars with impact registers 1/	Impacts of 5 miles per hour and over: 5 miles per hour	6 miles per hour	7 miles per hour	8 miles per hour	9 miles per hour	10 miles per hour	11 miles per hour	Total impacts	Impacts per car	Average speed 2/	Average impact force index 3/	Impacts in yards or terminals
		Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	MPH	Average No.	Percent
Upright loads														
Half-bushel baskets														
Georgia	1956	2	7	2	-	-	-	-	-	9	4.5	5.2	123.5	
Percent of total			77.8	22.2						100.0				
Three-quarter-bushel baskets														
South Carolina	1956	9	27	6	3	4	-	2	-	42	4.7	5.8	166.0	
Percent of total			64.3	14.3	7.1	9.5	-	4.8	-	100.0				
One-bushel baskets														
South Carolina	1956	1	-	-	-	1	-	-	-	1	1.0	8.0	64.0	
Percent of total						100.0				100.0				
All upright loads														
All sizes of baskets	1956	12	34	8	3	5	-	2	-	52	4.3	5.8	150.4	67.3
Percent of total			65.4	15.4	5.8	9.6	-	3.8	-	100.0				
Alternately inverted loads														
Half-bushel baskets														
Georgia	1956	27	133	38	22	7	1	1	1	203	7.5	5.6	241.5	
Percent of total			65.5	18.7	10.8	3.5	0.5	0.5	0.5	100.0				
Three-quarter-bushel baskets														
South Carolina	1956	8	21	6	3	3	1	1	-	35	4.4	5.9	154.5	
Percent of total			60.0	17.1	8.6	8.6	2.9	2.8	-	100.0				
One-bushel baskets														
South Carolina	1956	5	30	6	-	-	-	-	1	37	7.4	5.3	217.4	
Percent of total			81.1	16.2	-	-	-	-	2.7	100.0				
Colorado	1955	12	44	22	3	1	-	-	-	70	5.8	5.4	175.3	
Percent of total			62.9	31.4	4.3	1.4	-	-	-	100.0				
All bushel baskets	1955-6	17	74	28	3	1	-	-	1	107	6.3	5.4	187.6	
Percent of total			69.2	26.2	2.8	0.9	-	-	0.9	100.0				
All alternately inverted loads														
All sizes of baskets	1955-6	52	288	72	28	11	2	2	2	345	6.6	5.6	211.0	4/ 70.5
Percent of total			66.1	20.8	8.1	3.2	0.6	0.6	0.6	100.0				

1/ Including only cars with recorded impacts of 5 miles per hour and over.
2/ Weighted average.
3/ Summation of the squares of impact speeds. The destructive force transmitted to the load increaaes at approximately the same ratio as the aquares of impact speeds.
4/ Includes only 40 cars for which this type of information as to location of impacts was available.

Table 32.--Potential savings to shippers and receivers in carload refrigeration costs from use of alternately inverted loads instead of upright end-to-end offset and crosswise offset loads for equivalent carloads of fresh peaches and prunes by rail, 1956

From	To	Type of load	Baskets per car	Standard refrigeration charge: Per car 1/	Standard refrigeration charge: Per basket	Savings from use of alternately inverted load: Per basket	Savings from use of alternately inverted load: Total
			Number	Dollars	Cents	Cents	Dollars
			Peaches in 1/2-bushel baskets				
Fort Valley, Ga.	Jersey City, N.J.	End-to-end offset....	800	95.82	11.98	-	-
		Alternately inverted.	868	95.82	11.04	.94	8.16
Fort Valley, Ga.	Pittsburgh, Pa.	End-to-end offset....	800	101.90	12.74	-	-
		Alternately inverted.	868	101.90	11.74	1.00	8.68
Fort Valley, Ga.	Cleveland, Ohio	End-to-end offset....	800	101.14	12.64	-	-
		Alternately inverted.	868	101.14	11.65	.99	8.59
Fort Valley, Ga.	Providence, R.I.	End-to-end offset....	800	108.74	13.59	-	-
		Alternately inverted.	868	108.74	12.53	1.06	9.20
Fort Valley, Ga.	Cincinnati, Ohio	End-to-end offset....	800	88.98	11.12	-	-
		Alternately inverted.	868	88.98	10.25	.87	7.55
Johnston, S.C.	Pittsburgh, Pa.	End-to-end offset....	800	92.77	11.60	-	-
		Alternately inverted.	868	92.77	10.69	.91	7.90
Johnston, S.C.	Toronto, Ont.	End-to-end offset....	800	115.59	14.45	-	-
		Alternately inverted.	868	115.59	13.32	1.13	9.80
Johnston, S.C.	Baltimore, Md.	End-to-end offset....	800	91.25	11.41	-	-
		Alternately inverted.	868	91.25	10.51	.90	7.81
			Peaches in 3/4-bushel baskets				
Gramling, S.C.	Chicago, Ill.	Crosswise offset.....	594	110.27	18.56	-	-
		Alternately inverted.	672	110.27	16.41	2.15	14.44
Spartanburg, S.C.	Providence, R.I.	Crosswise offset.....	594	101.14	17.03	-	-
		Alternately inverted.	672	101.14	15.05	1.98	13.31

(Continued)

Sheet No. 2

Table 32.--Potential savings to shippers and receivers in carload refrigeration costs from use of alternately inverted loads instead of upright end-to-end offset and crosswise offset loads for equivalent carloads of fresh peaches and prunes by rail, 1956--(Continued)

From	To	Type of load	Baskets per car	Standard refrigeration charge: Per car 1/	Standard refrigeration charge: Per basket	Savings from use of alternately inverted load: Per basket	Savings from use of alternately inverted load: Total
			Number	Dollars	Cents	Cents	Dollars
			Peaches in 3/4-bushel baskets (continued)				
Gaffney, S.C.	Philadelphia, Pa.	Crosswise offset......	594	91.25	15.36	-	-
		Alternately inverted..	672	91.25	13.58	1.78	11.96
Inman, S.C.	Boston, Mass.	Crosswise offset......	594	101.14	17.03	-	-
		Alternately inverted..	672	101.14	15.05	1.98	13.31
Inman, S.C.	Detroit, Mich.	Crosswise offset......	594	110.27	18.56	-	-
		Alternately inverted..	672	110.27	16.41	2.15	14.41
Gramling, S.C.	Hartford, Conn.	Crosswise offset......	594	101.14	17.03	-	-
		Alternately inverted..	672	101.14	15.05	1.98	13.31
Gramling, S.C.	Jersey City, N.J.	Crosswise offset......	594	91.25	15.36	-	-
		Alternately inverted..	672	91.25	13.53	1.78	11.96
Gaffney, S.C.	Pittsburgh, Pa.	Crosswise offset......	594	92.77	15.62	-	-
		Alternately inverted..	672	92.77	13.80	1.82	12.23
Gramling, S.C.	Cincinnati, Ohio	Crosswise offset......	594	96.58	16.26	-	-
		Alternately inverted..	672	96.58	14.37	1.89	12.70
			Peaches in 1-bushel baskets				
Johnston, S.C.	New Haven, Conn.	End-to-end offset.....	396	101.14	25.54	-	-
		Alternately inverted..	413	101.14	24.49	1.05	4.34
Spartanburg, S.C.	Montreal, Que.	End-to-end offset.....	396	115.59	29.19	-	-
		Alternately inverted..	413	115.59	27.99	1.20	4.96
Spartanburg, S.C.	Cleveland, Ohio	End-to-end offset.....	396	107.99	27.27	-	-
		Alternately inverted..	413	107.99	26.15	1.12	4.63

(Continued)

Table 32.--Potential savings to shippers and receivers in carload refrigeration costs from use of alternately inverted loads instead of upright end-to-end offset and crosswise offset loads for equivalent carloads of fresh peaches and prunes by rail, 1956--(Continued)

From	To	Type of load	Baskets per car	Standard refrigeration charge: Per car 1/	Standard refrigeration charge: Per basket	Savings from use of alternately inverted load: Per basket	Savings from use of alternately inverted load: Total
			Number	Dollars	Cents	Cents	Dollars
			Peaches in 1-bushel baskets (continued)				
Inman, S.C.	Chicago, Ill.	End-to-end offset.....	396	110.27	27.84	-	-
		Alternately inverted..	413	110.27	26.70	1.14	4.71
Spartanburg, S.C.	Pittsburgh, Pa.	End-to-end offset.....	396	92.77	23.43	-	-
		Alternately inverted..	413	92.77	22.46	.97	4.01
Inman, S.C.	Newark, N.J.	End-to-end offset.....	396	91.25	23.04	-	-
		Alternately inverted..	413	91.25	22.09	.95	3.92
Palisade, Colo.	Houston, Texas	End-to-end offset.....	396	106.47	26.89	-	-
		Alternately inverted..	413	106.47	25.78	1.11	4.58
Palisade, Colo.	Wichita, Kan.	End-to-end offset.....	396	87.46	22.09	-	-
		Alternately inverted..	413	87.46	21.18	.91	3.76
Palisade, Colo.	San Antonio, Tex.	End-to-end offset.....	396	98.85	24.96	-	-
		Alternately inverted..	413	98.85	23.93	1.03	4.25
			Prunes in 1/2-bushel baskets				
Homedale, Idaho	Kansas City, Mo.	End-to-end offset.....	864	98.85	11.44	-	-
		Alternately inverted..	896	98.85	11.03	.41	3.67
Emmett, Idaho	Chicago, Ill.	End-to-end offset.....	864	106.47	12.32	-	-
		Alternately inverted..	896	106.47	11.88	.44	3.94
Fruitland, Idaho	Scranton, Pa.	End-to-end offset.....	864	129.27	14.96	-	-
		Alternately inverted..	896	129.27	14.43	.53	4.75
Fruitland, Idaho	New York, N.Y.	End-to-end offset.....	864	129.27	14.96	-	-
		Alternately inverted..	896	129.27	14.43	.53	4.75

(Continued)

Table 32.--Potential savings to shippers and receivers in carload refrigeration costs from use of alternately inverted loads instead of upright end-to-end offset and crosswise offset loads for equivalent carloads of fresh peaches and prunes by rail, 1956--(Continued)

From	To	Type of load	Baskets per car	Standard refrigeration charge: Per car 1/	Standard refrigeration charge: Per basket	Savings from use of alternately inverted loads: Per basket	Savings from use of alternately inverted loads: Total
			Number	Dollars	Cents	Cents	Dollars
			Prunes in 1/2-bushel baskets (continued)				
Emmett, Idaho	St. Louis, Mo.	End-to-end offset.....	864	106.47	12.32	-	-
		Alternately inverted..	896	106.47	11.38	.44	3.94
Emmett, Idaho	Houston, Texas	End-to-end offset.....	864	114.07	13.20	-	-
		Alternately inverted..	896	114.07	12.73	.47	4.21
Emmett, Idaho	Detroit, Mich.	End-to-end offset.....	864	117.88	13.64	-	-
		Alternately inverted..	896	117.88	13.15	.49	4.39
Emmett, Idaho	Boston, Mass.	End-to-end offset.....	864	133.08	15.40	-	-
		Alternately inverted..	896	133.08	14.85	.55	4.93
Fruitland, Idaho	Philadelphia, Pa.	End-to-end offset.....	864	129.27	14.96	-	-
		Alternately inverted..	896	129.27	14.43	.53	4.75

1/ From Perishable Protective Tariff No. 16, ICC No. 31, issued by W. T.Jamison, Agent, National Perishable Freight Committee, Chicago, Ill., effective during the 1956 season.

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